

Jones, Simon

From: Jackson, Corey
Sent: December-22-17 10:25 AM
To: MacDougall, Lesley; Houston, Kim; Taylor, Nathan; Chamberlain, Jon; Paylor, Adrienne; Higgins, Mark; Jones, Simon; Garver, Kyle; Johnson, Stewart
Subject: Province of BC Announcement re: review of effluent discharge permits and sea lice treatment

Follow Up Flag: Follow up
Flag Status: Flagged

As discussed, attached is the Province of BC news release related to environmental protection around aquaculture.

Here is the specific reference to sea lice treatment and the *Integrated Pest Management Regulations*:

- In addition, the ministry will immediately review whether treatments for sea lice are scientifically supported and are consistent with best practices in other jurisdictions. Results from this review will inform potential changes to the Integrated Pest Management Regulation, which regulates sea lice treatment. "Our bottom line is to make sure that we protect our wild salmon and keep harmful substances from entering the marine environment as a result of these operations," said Heyman.

Let me know if you have any questions or want to discuss.
Corey

Corey Jackson

A/ Director, Aquaculture Management Division
Fisheries and Oceans Canada / Pacific Region
Corey.Jackson@dfo-mpo.gc.ca / Tel: 604-666-7009

Gestionnaire des ressources, poissons pélagiques
Pêches et Océans Canada / Région du Pacifique
Corey.Jackson@dfo-mpo.gc.ca / Tél. : 604-666-7009



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NR_Fish_Effluen...

-----Original Appointment-----

From: MacDougall, Lesley
Sent: December-07-17 11:53 AM
To: MacDougall, Lesley; Houston, Kim; Taylor, Nathan; Chamberlain, Jon; Jackson, Corey; Paylor, Adrienne; Higgins, Mark; Jones, Simon; Garver, Kyle; Johnson, Stewart
Subject: Aquaculture RSIA's re-group
When: December-22-17 10:00 AM-11:00 AM (UTC-08:00) Pacific Time (US & Canada).
Where: CSAP office - teleconference 1-877-413-4790

s.16(2)(c)

Hello all;

A re-group required!

Meeting to do the following:

- 1) Review re-scoped AMD RSIs where required (re-scoped RSIs will be circulated prior to)
- 2) Provide time for OSD's input for questions requiring oceanographic/hydrodynamic modelling input
- 3) Jon? Any thoughts on your work on relative salmon exposure risk based on #'s of salmon / time near fish farms etc?
- 4) Update from Nathan and Corey re: discussions on resources for "Advice on genetic and ecological risks of escaped cultured chinook to wild Chinook salmon in BC"

By the end of this meeting we should have a set of RSIs where the science 'ask' is clear, and we should have a clearer picture of what science deliverables are achievable – in the near term, or on a 2-3 year horizon.

Lesley



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COLUMBIA

Available at <https://news.gov.bc.ca/releases/2017ENV0075-002077>

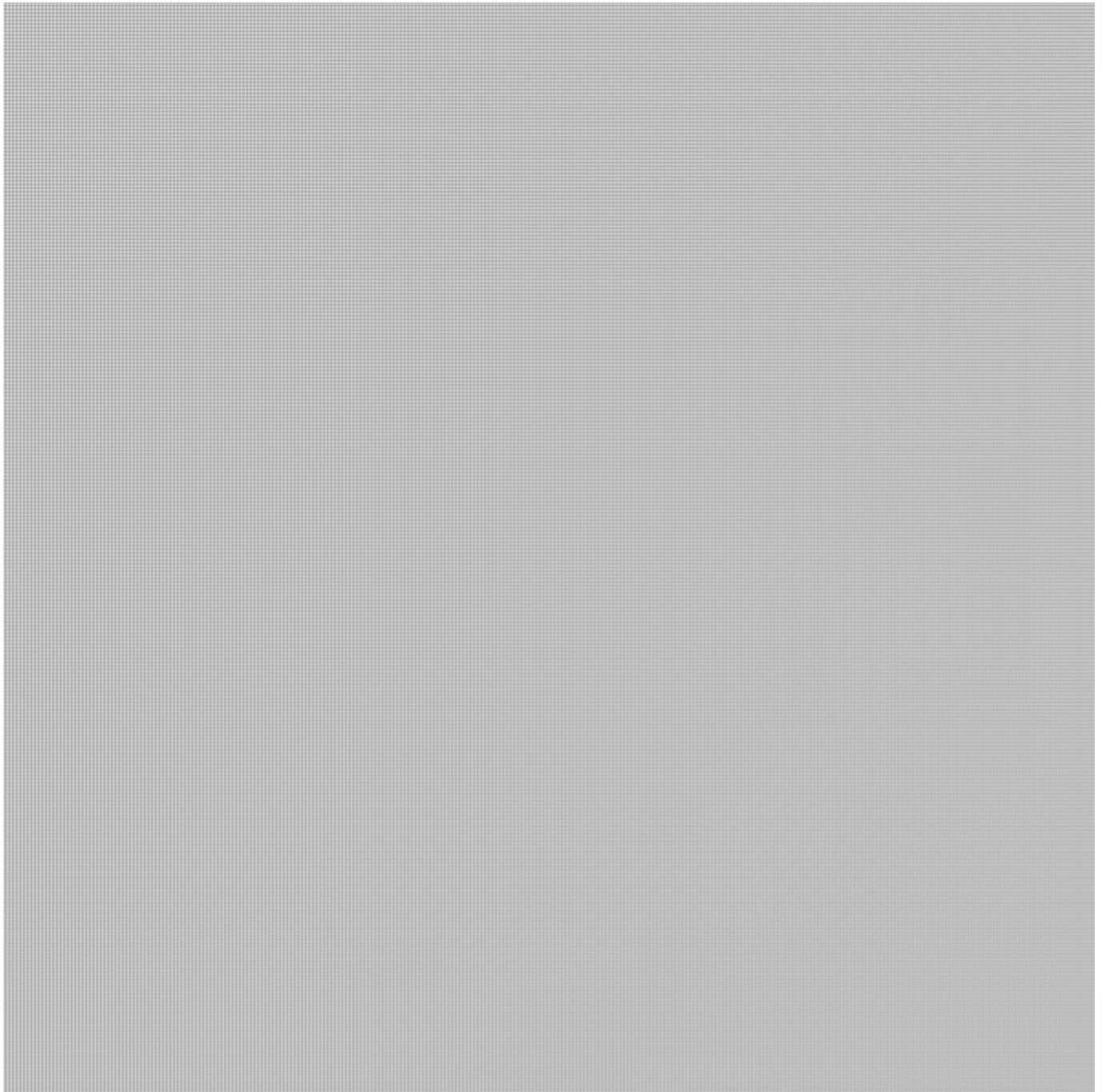
NEWS RELEASE

For Immediate Release
[release number]
December 20, 2017

Ministry of Environment and Climate Change
Strategy

Province to improve environmental protections for coastal areas

VICTORIA – The provincial government will protect the environment and health of wild salmon by strengthening the requirements for fish processing and fish farming operations.



From: Keith, Ian
To: Waddington, Zac
Subject: RE: Letter to Cermaq
Date: January-09-18 9:24:12 PM

Hi Zac,

I reviewed my notes from the October SL report and misspoke today. Your notes in the October Comments SL CSV are right, that [REDACTED] said SLICE tissue levels were okay. He also said that Saranac and Mussel were treated at the same time and responded well, and I said that the late chum run will bring additional lice and so [REDACTED] was mininterpreting the presence of lice on the Millar Channel fish. Treatment October 10 at Dixon, Millar, and Rant is early in order to have residual therapeutic levels at the time of this chum run. (I said 42 days before levels drop below therapeutic levels, but this is for therapeutic levels based on historic sensitive levels.) So, as before, I don't think there is necessarily resistance at these farms despite [REDACTED] comments about resistance, and therefore I have to retract my questioning [REDACTED]

It could be that [REDACTED] was more successful because of changes in climate and additional years of aquaculture in Clayoquot. And it could be that [REDACTED] choice of huge management area for coordinated treatment is defensible although we know that lice behaviour is more localised. Millar Channel sites, Ross, Millar, Bawden, Dixon should be treated as an area in my opinion, after the rest of Tofino North.

This said, and why I asked about having Cermaq harvest plan in writing, is I see in [REDACTED] plan the same pattern as I saw from Grieg and MHC. [REDACTED]

[REDACTED]

Cermaq has their grade harvest starting in February for Millar, March for Ross, but completion of harvest for Dixon finished by March. I assumed to harvest to empty these farms by end of February but now suspect that [REDACTED] is proposing to advance Ross harvest one month.

Ian

Dr. Ian Keith DVM
Field Operations Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations - Fish Health
#103 - 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)

s.19(1)

From: Waddington, Zac
Sent: Tuesday, January 09, 2018 5:21 PM
To: Keith, Ian
Subject: Letter to Cermaq

s.20(1)(b)

s.21(1)(a)

s.21(1)(b)

See what you think Ian,

We have reviewed the November sea lice data for the Clayoquot farms: Dixon, Millar Channel and Ross Pass. As I'm sure you are aware, they are over threshold despite SLICE treatments at the end of September/ beginning of October at all three sites. The expected residual effect of SLICE has not been observed, and some of the sites continue to trend upwards. We are aware of the difficulties faced by Cermaq in getting the approvals necessary for the use of Paramove in Clayoquot. Though we empathize with this challenge, we want to reiterate the expectation that your lice burden on affected farms will be effectively dealt with by the beginning of the out migration period beginning in March, as per the conditions of licence. If harvest is to be the tool of management, it is expected that this will be finished by the end of February.

Thanks again for your cooperation and compliance,

Dr. Zac Waddington DVM, B.Env.Sc (Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

From: Keith, Ian
To: Waddington, Zac
Subject: re
Date: February-14-18 3:50:19 PM

And thank you for the plans submitted, as per licence conditions. Millar Channel is predictable with the chum spawn in the late fall, with a spike in motile counts on the fish in the farms in the channel. The December count data from Ross, Dixon and Millar have next to no chalimus but high motiles, consistent with effective treatment in early fall and recruitment of motiles from the spawning fish. Zac appreciates the cycles affecting lice abundance too and was expecting the drop in abundance at Dixon with the winter rains.

It is a relief that Bawden lice bioassay is favourable because with the chalimus on these fish would not predict successful manage with rains, despite Arriagada et al. (2016) data that would predict some effect on pre-motile stages.

Your plan provides me the opportunity to raise two matters regarding sea lice management plans in general. These are: one, that there would be very few circumstances where we should accept plans contingent on borrowed equipment and permits not yet in hand; and two, implied in Zac's letter to you in mid January is that accelerated harvest is an option when threshold occurs during the outmigration period, that the regulation is to enter the outmigration period below threshold.

The circumstances concerning your proposal of management of the Millar Channel sites are unique, given the proximity of the wellboat in relation to your sites, and the benefit of the peroxide treatment for SLICE sustainability should be supported by the regulator.

I am pleased that you have applied for a pesticide use permit for Clayoquot; however, as emphasized at the Integrated Pest Management workshop January 10-11 it is our expectation that preparations are secured for integrated sea lice management going forward, whether permits and equipment for hydrogen peroxide or physical lice removal.

Dr. Ian Keith DVM

Field Operations Veterinarian - Pacific Region

Fisheries and Oceans Canada | Pêches et Océans Canada

Fisheries Management

Aquaculture Management Division | Gestion de l'aquaculture

Aquaculture Environmental Operations - Fish Health

#103 - 2435 Mansfield Drive

Courtenay, British Columbia V9N 2M2

Telephone | Téléphone: 250-703-0917

Mobile | Portable:

Fax | Télécopieur: 250-703-0921

Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)

s.19(1)

s.20(1)(b)

From: Manchester, Howie
To: Keith, Ian; Waddington, Zac
Subject: Fw: Additional sea lice audit at Ross Pass
Date: February-26-18 11:03:50 AM

I would think we have determined it necessary. Have contacted company, will make arrangements with the site.

Not sure it's necessary but do you think it's a good idea to give [REDACTED] a heads up?
Might circumvent some headaches?

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Keith, Ian <Ian.Keith@dfo-mpo.gc.ca>
Sent: Monday, February 26, 2018 10:41 AM
To: Manchester, Howie
Cc: Waddington, Zac
Subject: RE: Additional sea lice audit at Ross Pass

Hi Howie,

Greg and Joe say that the Ross inspection is necessary, and that it is an inspection not an investigation.

Adrienne and Allison have been contacted by Ministry of Environment regarding the Pesticide Use Permit for Clayoquot is the only update we have.

Ian

From: Manchester, Howie
Sent: February-25-18 10:57 AM
To: [REDACTED]
Cc: [REDACTED]; Waddington, Zac; Keith, Ian
Subject: Additional sea lice audit at Ross Pass

s.19(1)

Hi [REDACTED]

There will be an amendment for the audit to be conducted at Ross Pass.

After reviewing submitted sea lice records and since we are in the area our veterinarian thinks it would be beneficial to extend our audit coverage in the area. We will, therefore, need to conduct an Seal Lice Audit in addition to the Fish Health Audit at Ross Pass. If you have any questions or would like to discuss further please contact our DFO veterinarians directly at Dr. Ian Keith 250-703-0917 or Dr. Zac Waddington 250-703-0902.

Please let me know if there are concerns or questions regarding this change.

Thank you for adjusting your preparations to accommodate this. Please note the Sea Lice

Preparations refresher below.

Howie

SL Audit Preparations:

- It is not desirable to sample fish for a DFO SL Audit during or within a few weeks (21d) of a slice treatment. Ideally Industry FH staff will have made us aware, well in advance of the audit, if a scheduled SL audit falls within a treatment or within a few weeks of a treatment ending. In those cases, and with notice, we're able to re-select for the site. That said, please make DFO staff aware of any Slice or H2O2 treatments that may impact lice numbers, i.e. communicate the end date of any recent treatments (within the last month), if applicable.
- A Sea Lice Audit can be postponed due to a recent transfer but this is not mandated by the licence. Industry may choose to delay handling for SL sampling following a recent transfer. Typically 30days is a common convention for "recent" in this context. From our audit scheduling perspective, the data obtained are not as valuable so soon after a recent SW entry and we would ideally wait until 3 pens have been onsite longer than 30 days following smolt entry from a hatchery. For sea to sea transfers the full 30days is not required; an audit can be scheduled when the facility is comfortable handling fish.
- Please be ready.
- We always do 3 pens (one of which is your reference) and 20 fish per pen. We always count the tote for each pen after 20 fish.
- Feel encouraged to contact us directly to pin down an ETA, if necessary, to help you plan and be prepared. Anything you can do to have nets in the water, gear set up and additional nets to avoid having to move equipment is greatly appreciated. Thank you.
- Please be adequately staffed. This is your audit and DFO is hands off with the exception of counting half the fish.
- Remember that we do not take grilse fish during a DFO SL audit. If you have a high number of maturing fish please plan accordingly to ensure a random sample of 20 fish can be caught in a reasonable time frame.
- It's your call as to whether or not you feed your fish before the SL audit. Please ensure that you are able to catch fish in a reasonable period of time for the audit. We are generally limited to about 3 hours on site. Please plan for that and communicate any foreseeable issues with expediency in advance, so our field team can discuss and plan with the site.
- If you are experiencing low DO or any other event that may preclude scheduled SL sampling, please communicate this to DFO in advance of the audit, if known.
- We will often ask to split up and start the FH and SL audits simultaneously. It's great when that can be accommodated. Thanks in advance for being ready for that when able. If being ready to divide and conquer requires you to pump morts (all or partially) in advance of DFO arrival please discuss this with DFO FH in advance of the audit as the field team may have flexibility to avoid this.

Delaney, Paula

From: Paylor, Adrienne
Sent: March-06-18 6:06 PM
To: Webb, Allison
Subject: Fw: lice update

FYI
Below is our vet to vet communication regarding elevated sea lice levels heading into the out migration window. Ian will get us an update on harvest rate and progress in the morning in case it comes up at FAIAP.

A
Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Keith, Ian <Ian.Keith@dfo-mpo.gc.ca>
Sent: Tuesday, March 6, 2018 4:58 PM
To: Paylor, Adrienne
Subject: FW: lice update

Dr. Ian Keith DVM
Field Operations Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations - Fish Health
#103 - 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)
s.19(1)

From: Keith, Ian
Sent: Sunday, February 18, 2018 12:03 AM
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: lice update

Hi [REDACTED]
[REDACTED]

I expected the rise in chalimus counts in January counts at Millar and Ross given that January's rainfall failed to reduce abundance at these farm to below threshold as of end of January. Good job in initiating harvesting at full rate at Millar and Ross [REDACTED]

If you were able to have permits and Grieg's wellboat, you were going to start peroxide treatment beginning Thursday, February 15, as the alternative to harvest. Please give us an update. I trust that SLICE treatment at Bawden went well.

This is an opportunity to raise two matters regarding sea lice management plans in general. These are: 1) as a reminder in Zac's letter to you in mid January, harvest "which will reduce the absolute lice inventory" is an option when threshold

is met during the outmigration period, the regulation is to enter the outmigration period below threshold; 2) we supported registration of hydrogen peroxide so it is industry's responsibility to make use of this tool as an alternative to harvest and to preserve SLICE efficacy. Your plan has reflected this understanding – your harvesting rate, given when you started, would allow you to meet regulation if peroxide treatment hasn't been possible.

Thanks [REDACTED]

Regards,
Ian

Dr. Ian Keith DVM
Field Operations Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations - Fish Health
#103 - 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

From: [REDACTED]
Sent: Friday, February 02, 2018 4:46 PM
To: Keith, Ian
Cc: [REDACTED]
Subject: lice update

Hi Ian,

Sorry I missed your call. Left a message but essentially: we continue to await the peroxide permit for use in Tofino. We've coordinated as if it were available and the MD even sat down with MOE and the MD to stress the importance - still waiting. In the interim the lice levels have reduced significantly below 3 motile lice/ fish at Dixon due to low salinity. Lice levels remain elevated and relatively unchanged at Ross and Millar but we have changed to harvesting those two sites to the capacity of the plant. Lice levels remain elevated and high at Bawden but we are treating at Bawden with SLICE. We will continue to monitor for lice and adjust accordingly.

I'll be [REDACTED] intermittently checking emails. In the interim you can contact either [REDACTED] for further details.

Thanks,
[REDACTED]

CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
203 - 919 Island Hwy
V9W 2C2 Campbell River, BC, Canada

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Delaney, Paula

From: Sandberg, Krista
Sent: March-12-18 1:56 PM
To: Webb, Allison; Paylor, Adrienne
Subject: RE: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Allison,

It's interesting that you ask that question as this report is new in the last year or so. We used to report industry and DFO audit lice data all in the same report. However, a couple years ago there was a request from industry to begin posting industry submitted lice data on a monthly basis rather than quarterly. In addition, it was often difficult to compare the industry abundance to the DFO abundance because industry counts are often an average of 2 counting events (bi-weekly), and DFO counts are from a single day. Thus, to expedite the monthly reports and to make our audit data more clear, we chose to separate the 2 reports. You are correct in that the audit report does not address exceedances – this information can be found in the monthly abundance report and I think that it is very clear and transparent there. To my knowledge, we have not received any questions on this, but I think that most people who are looking at the reports likely know what they are looking for and where to find it. Perhaps we need to find a way of making that more clear.

I will be sending you the November – January sea lice abundance reports for your review as soon as I get approval from Zac and Adrienne, but if you want to look at them in the meantime, the link is here: [X:\1. PUBLIC REPORTING\Sea Lice\Monthly Farm Level \(A\)\2017\Farm Level Sea Lice \(A\) 2017 csv.xlsx](#)

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Webb, Allison
Sent: Monday, March 12, 2018 12:59 PM
To: Sandberg, Krista; Paylor, Adrienne
Subject: RE: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Krista – Thanks for this. This is ready to post from my perspective.

I'm assuming that this is how we have been reporting for some time now. Are we typically receiving questions where the reporting shows over our threshold levels? I don't think that this is the purpose of this report, but I am thinking that it just starts other questions and are we able to answer those in a transparent way?

Thanks,
Allison

s.16(2)(c)

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Sandberg, Krista
Sent: 2018-March-09 12:55 PM
To: Webb, Allison
Subject: FW: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Allison,

Please see below for the link to the sea lice audit report that is ready for your review. This one is the results of our audit counts compared to industry's counts on the same day. Please let me know if you have any questions.

Have a great weekend,
Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Paylor, Adrienne
Sent: Friday, March 09, 2018 12:31 PM
To: Sandberg, Krista
Subject: RE: 2017Q3 and Q4 sea lice audit reports ready for your review

Approved thanks.
Adrienne

From: Sandberg, Krista
Sent: Friday, March 09, 2018 11:32 AM
To: Paylor, Adrienne
Subject: FW: 2017Q3 and Q4 sea lice audit reports ready for your review

Sea lice audit pending your approval, please see below...

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Sandberg, Krista
Sent: Friday, January 12, 2018 8:02 AM
To: Paylor, Adrienne
Cc: Waddington, Zac
Subject: FW: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Adrienne,

The Q3/Q4 sea lice audit report is ready for your review. We've made a couple changes to the report including replacing "year" and "month" with "audit date" and removing the column for # of counts. I'm not sure why this was retained. It came from the original report which included the whole month's industry counts, so it never should have been there in the first place.

s.16(2)(c)

X:\1. PUBLIC REPORTING\Sea Lice\Audit Summary\Sea Lice Audit 2016-2017 csv.xlsx

Zac, when I send the file to communications for posting, I will also request that the definitions be re-posted to reflect the changes.

Cheers,
Krista.

Krista Sandberg

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Office | Bureau 250-286-5835



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From: Waddington, Zac

Sent: Thursday, January 11, 2018 5:09 PM

To: Sandberg, Krista

Subject: RE: 2017Q3 and Q4 sea lice audit reports ready for your review

Yeah the changes to the working file are all good. I see in the definitions that there is a note to delete the number of counts performed, which makes sense given that it's not part of the reporting. Will that be taken out by communications?

Zac

From: Sandberg, Krista

Sent: January-11-18 4:05 PM

To: Waddington, Zac

Subject: FW: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Zac,

I've made the improvements to this report that we discussed on the phone, and I think you approved verbally, but can you please have one more look approve via email so I can send this up to Adrienne?

Thanks,
Krista.

Krista Sandberg

Cellular | Cellulaire
Office | Bureau 250-286-5835



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From: Sandberg, Krista

Sent: Tuesday, January 02, 2018 3:24 PM

To: Waddington, Zac

Subject: 2017Q3 and Q4 sea lice audit reports ready for your review

Hi Zac,

s.16(2)(c)

The Q3 and Q4 sea lice audit reports are ready for your review. Please review the “working” tab. There are a couple differences that you may want to look in to. I’m not sure if you want to add the “licence holder is taking steps to correct the problem” comment or not. Let me know.

X:\1. PUBLIC REPORTING\Sea Lice\Audit Summary\Sea Lice Audit 2016-2017 csv.xlsx

Cheers,
Krista.

Krista Sandberg

Acting Senior Shellfish Aquaculture Biologist | Biologiste de l'aquaculture
Aquaculture Management Division | Gestion de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada
krista.sandberg@dfo-mpo.gc.ca
Cellular | Cellulaire [REDACTED]
Office | Bureau 250-286-5835



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s.16(2)(c)

Delaney, Paula

From: Paylor, Adrienne
Sent: May-01-18 12:49 PM
To: Lavigne, Lauren
Cc: Webb, Allison; McCorquodale, Brenda
Subject: Sonja's Sea Lice state of Knowledge Report
Attachments: SEA LICE Statement of Knowledge Dec 22_15.docx

This report was never officially approved by our management team but does contains some helpful info and recommendations.

Lauren are you going to pass it along to NHQ with the IPM document?

Thanks,
Adrienne

STATE OF KNOWLEDGE ON SEA LICE AND THE FUTURE OF ITS MANAGEMENT IN BRITISH COLUMBIA

Sonja Saksida DVM MSc

December 2015

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Forward

The following document was prepared for Aquaculture Management Division (AMD) of Fisheries and Oceans Canada. The document provides a summary of the state of knowledge regarding sea lice in British Columbia including its management on salmon farms. The purpose of the document is to provide information that will assist the AMD in developing and improving the current management scheme.

1 What did we know about Pacific salmon and sea lice in British Columbia prior to 2003?

1.1 Pacific Salmon

There are five main species of wild anadromous Pacific Salmon found in British Columbia (BC): Pink (*Oncorhynchus gorbuscha*), Chum (*O. keta*), Coho (*O. kisutch*), Chinook (*O. tshawytscha*) and Sockeye (*O. nerka*). Although most salmon stocks are migratory, leaving the nearshore region of BC for feeding grounds offshore, a few stocks (primarily Coho) spend their entire marine lifecycle in local waters (Beamish *et al.* 2007). Large numbers of wild salmon are found in the spring/summer during the out-migration of juvenile salmon and summer/fall when maturing salmon are returning to their natal rivers. For example between 10 and 40 million Adult Pacific salmon can pass through Queen Charlotte Strait.

Each Pacific salmon species has its own unique life-cycle although they are all semelparous (die after spawning). Pink salmon are the most abundant, smallest in size, have the shortest life cycle consisting of distinct even and odd year runs. They emerge into the marine environment shortly after hatch and have the highest straying rate. Chum salmon are also abundant, and like the Pink salmon head to the marine environment shortly after hatching where they remain for 2 to 6 years before returning to their natal rivers. Sockeye salmon remain in freshwater 1 to 3 years and then in the marine environment for 2 to 3 years. Chinook are the largest of the Pacific salmon. Young may spend up to a year in freshwater and then between 2 to 7 years in saltwater. Coho salmon spend 1 to 2 years in freshwater and up to 18 months in the marine environment.

Salmon species distribution and abundance vary regionally in BC for example:

- The South Coast Mainland has populations of all 5 species of salmon however the largest river system in the region, the Fraser River, does not have even year Pink salmon.
- Broughton Archipelago has very few Sockeye salmon.
- Central Coast (Klemtu) has no major Chinook salmon runs.
- West Coast of Vancouver Island has no major Pink salmon runs.

Very little information is available about specific migratory routes for the different stocks; particularly for juvenile stages.

1.2 Sea lice

There are 3 species most commonly reported on salmon in British Columbia

1.2.1 *Lepeophtheirus salmonis*

The species of sea louse most commonly reported on wild (Beamish *et al.* 2005) and farmed salmonids (Saksida *et al.* 2007a) in coastal BC is *Lepeophtheirus salmonis* (*L. salmonis*). Commonly it is referred to as the salmon louse. However, Jones *et al.* (2006 a, b) describe significant naturally occurring *L. salmonis* infestations on three-spine stickleback (*Gasterosteus aculeatus*) in the wild. Three-spine stickleback were one of the four most common wild non-salmonid species netted or hooked in a survey of fish near salmon farms (Kent *et al.* 1998).

Morphologically, *L. salmonis* appear identical between the North Pacific and the North Atlantic regions. Genetically, however, Todd *et al.* (2004) reported low but significant differentiation in the variation of six microsatellite loci between North Pacific and North Atlantic *L. salmonis*. Yazawa *et al.* (2008) reported significant differences in the nuclear DNA sequences and the mitochondrial genome from *L. salmonis* collected from the North Pacific versus the North Atlantic. This all has led to the conclusion that the *L. salmonis* are distinct between the North Pacific and the North Atlantic regions.

There are major reports describing large infestations of *L. salmonis* on adult Pacific salmon in coastal waters and high seas (Nagasawa *et al.* 1993; Johnson *et al.* 1996; Nagasawa 2001; Beamish *et al.* 2005; Trudel *et al.* 2007). Summary can be found in a document prepared Saksida *et al.* (2015) prepared as part of the Canadian Science Advisory Secretariat (CSAS) National peer-review meeting, Sea Lice Monitoring and Non-Chemical Measures, held in Ottawa, Ontario, September 25-27, 2012. *L. salmonis* are commonly found in high numbers on native Pacific salmon species adults. Pink (*Onchorynchus gorbaschu*) and chum (*Onchorynchus keta*) salmon are considered the 'natural' hosts for the parasite (Nagasawa 2001). Due to their preference for salmonids, *L. salmonis* infections tend to be more chronic and persistent (Integrated Pest Management Report 2003).

Development rate and survival of egg, planktonic stages and parasitic stages of *L. salmonis* are governed by temperature, for example at 2°C, 3°C, 4°C and 5°C, the hatching of nauplii takes 45.1, 35.2, 27.6, and 21.6 days, respectively, and 8.7 days at 10°C (Boxaspen and Naess 2000). The generation time of *L. salmonis* ranges from 4 weeks at 18 °C to 8-9 weeks at 6 °C (Hayward *et al.* 2011). At lower temperatures, development can stall for example moult success was reduced at 2 °C with few copepodids recovered in winter field samples from the Bay of Fundy (Hogans 1995). In British Columbia, surface (1 m) seawater temperatures range from approximately 6 °C to 13°C so cessation of development due to low temperatures is not likely. In fact, it has been suggested that water temperatures do not appear to influence sea lice abundance on salmon farms in BC (see document prepared by Jones & Johnson 2015 prepared as part of the Canadian Science Advisory Secretariat (CSAS) National peer-review meeting, Sea Lice Monitoring and Non-Chemical Measures, held in Ottawa, Ontario, September 25-27, 2012).

Studies show that survival and development of *L. salmonis* is optimal in high salinity seawater (see Jones & Johnson 2015). Sutherland *et al.* (2012) characterized the significantly elevated expression of stress-associated genes in *L. salmonis* copepodids maintained in 27‰ seawater compared with 30‰.

1.2.2 *Caligus clemensi*

The sea louse, *Caligus clemensi* (*C. clemensi*), is common as well, but to a lesser degree than *L. salmonis* (Johnson *et al.* 2004) and commonly referred to as the herring louse. *Caligus clemensi* has a broad range of hosts including Pink, Coho, Chinook, Sockeye and Atlantic salmon (*Salmo salar*) as well as rainbow trout (*O. mykiss*), non-salmonid fishes (e.g. Pacific herring (*Clupea pallasii*) and three-spine stickleback) and elasmobranchs (Parker & Margolis 1964; Beamish *et al.* 2005). Highly motile preadult and adult *Caligus* species often infect farmed salmon as preadults or adults.

Infections by *Caligus* species tend towards acute and transient (Integrated Pest Management Report 2003). The prevalence of *C. clemensi* may be underestimated by sampling due to the high motility of these animals. Spawning herring are possibly a major source of *C. clemensi* for juvenile salmon in coastal BC (Beamish *et al.* 2009). Parker and Margolis (1964) suggested that this ecto-parasite is “specific to environment rather than host” –most likely a reflection of its wide host specificity.

1.2.3 *Lepeophtheirus cuneifer*

Lepeophtheirus cuneifer (*L. cuneifer*) is much less common than *L. salmonis* and *C. clemensi* (Kabata 1974). Twelve known hosts including including rainbow trout and Atlantic salmon have been reported (Johnston & Albright 1991a). *L. cuneifer* are relatively rare (and/or possibly not recognized). Adults and pre-adults lice are highly motile.

2 What are the health effects of *Lepeophtheirus salmonis* in British Columbia?

Serious health issues associated with *L. salmonis* infestations on farmed salmon have been frequently reported by salmon farming regions located in Europe and Eastern North America, but not in Japan or on the BC and Washington State coast (Johnson *et al.* 2004). Heavy infections and damage as a result of infections with *L. salmonis* were rare in BC and aquaculture veterinarians did not consider sea lice a serious health concern (Saksida *et al.* 2007a).

This discrepancy in pathology and epidemiology was difficult to explain when the identical-looking Atlantic and Pacific varieties of *L. salmonis* were believed to be the same species. But now, genetic and physiological differences between North Atlantic and Pacific Canadian *L. salmonis* indicate they are distinct varieties. Fast *et al.* (2003) reported considerable differences in physiological reaction (higher protease activity) in Coho and Atlantic salmon as well as rainbow trout mucous when exposed to *L. salmonis* collected from BC compared to *L. salmonis* collected from New Brunswick.

Studies show that survival and development of *L. salmonis* is optimal in high salinity seawater (see Jones & Johnson 2015). Sutherland *et al.* (2012) characterized the significantly elevated expression of stress-associated genes in *L. salmonis* copepodids maintained in 27‰ seawater compared with 30‰. Perhaps some of the difference in pathogenicity between the two species of *L. salmonis* may be environment related too-- the Atlantic Ocean is saltier than the Pacific (<http://www.mbari.org/chemsensor/pteo.htm>).

3 What is the history of sea lice on salmon farms in British Columbia?

3.1 Prior to 2003

Sea lice infestations were not considered a significant fish health issue on salmon farms in BC since pathogenic lesions as described in the literature (Finstad *et al.* 2000) and observed in Europe were rarely observed in BC. Consequently, prior to 2003, enumeration of sea lice only occurred only if there were health and/or welfare concerns at a farm site. Thus treatments for sea lice infestation were rare and limited data was recorded.

However, an unexpectedly low return of Pink salmon in 2002 led to reports in scientific journals (Morton & Williams 2003) and in the popular press suggesting that sea lice from Atlantic salmon farms were negatively impacting juvenile wild Pink salmon and, in turn, affecting wild salmon returns. Salmon farms in the Broughton Archipelago were singled out (farms in this area contributed 35-39% of total farmed Atlantic salmon production in BC between 2000 and 2006).

3.2 From 2003 - 2010

In response to these claims, the provincial government instituted stringent sea lice monitoring systems and control measures on salmon farms (Saksida *et al.* 2007a). In March 2003, routine sea lice monitoring began on Atlantic salmon farms in the Broughton Archipelago (originally as part of the Broughton Archipelago Sea Lice Action Plan).

In October 2003, the monitoring program in the Broughton Archipelago was expanded to include all British Columbia salmon farms as part of a provincial management plan known as the Sea Lice Management Strategy. This was done to collect knowledge of the sea lice situation in all areas in case other concerns were raised.

The Sea Lice Management Strategy used the similar structure to the Fish Health Monitoring Program which had been running since 2001. The BC coast line is divided into zones:

- Boundaries follow major drainages or watersheds.

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- Entire BC coastline (including Vancouver Island) is divided into 10 zones.
- Farms are contained in 7 of these zones.

The Sea Lice Management Strategy stipulated that during the period of juvenile Pink salmon migration out of the nearshore (March to July) ('critical' period), *L. salmonis* were to be maintained below 3 motile lice per fish (including all preadult and adult males and female *L. salmonis* stages). If *L. salmonis* levels exceed this threshold during March to July, the farmed fish had to be treated with medicant or be harvested. This threshold was lower than that prescribed in Norway at that time (6 motile *L. salmonis*) (Heusch *et al.* 2005). Management options during the rest of the year remained at the discretion of the farmer and attending veterinarian.

The threshold of 3 motile *L. salmonis* was not based on scientific evidence. It was selected by government and industry as a level that would allow precautionary management while more scientific data were gathered to better inform the issue. It acknowledged both: the lack of serious sea lice disease occurring in BC farmed salmon compared to other global jurisdictions with *L. salmonis*, and the large populations of wild salmon in BC that are known to carry sea lice and thus greatly influence the sea lice abundance on farmed salmon, particularly during the summer to fall return migration season.

As part of the monitoring program implemented in October 2003, farms growing Atlantic salmon in BC were required to report sea lice data into a database. This involved compulsory reporting of the abundance of chalimus and motile stages (preadult and adult stages) of *C. clemensi* and *L. salmonis* on a monthly basis. Monitoring and reporting of sea lice data on a farm begins as soon as one month has passed following the entry of the third pen of smolts; reporting could stop when less than three pens remain during harvest. The mandatory reporting could be interrupted in the event of sea lice treatment, other fish health events, or environmental problems, such as low dissolved oxygen.

The protocol for monitoring sea lice on salmon farms required that three pens (20 fish per pen) be assessed. Sampled pens included one index pen, that was the first pen populated in the system, and two "randomly" selected pens per sample period. Farms growing Pacific salmon are required to monitor and report sea lice information less frequently: thirty fish per farm on a quarterly basis.

For assessment, fish were most often sedated in totes and examined for sea lice (totes are examined for lice as well). Motile stages of *L. salmonis* and *C. clemensi* are identified and counted. Attached stages (copepodid and chalimus stages) were counted also, but species determination is not required.

The farms reported counts to a central database owned by the British Columbia Salmon Farmers Association, and monthly reports summarizing sea lice abundance for motile *L. salmonis*, adult female *L. salmonis* and motile *C. clemensi* by zone are provided to the British Columbia Ministry of Agriculture and Lands.

In addition to farm reporting of lice levels the provincial government also had an audit program. Government Fish Health Technicians conducted sea lice audits:

- 25% of active¹ farms audited between July and March
- 50% of active farms audited between March and July

For each pen, 10 fish examined by farm staff, 10 by government technicians. The values were compared for agreement.

These monthly sea lice abundance data summaries were made available to the public through the government website. Annual reports were created to provide a summary and interpretation of the finding of the program including the audit program. Therapeutant volumes were also reported in the annual report.

3.3 Since 2010

In 2010, Fisheries and Oceans Canada (DFO) took over full management of aquaculture (<http://www.dfo-mpo.gc.ca/media/back-fiche/2014/hq-ac06b-eng.htm>). During the transition period between authorities, sea lice audits as well as Fish Health Audits were conducted by a third party research facility (BC Centre for Aquatic Health) to maintain continuity of the data as the DFO program was still under development. Audit program by DFO started in the second quarter of 2011 (Table 1).

Threshold levels, monitoring and audit programs remained similar to the provincial governments. However farms now were required to report sea lice levels directly to the department. Data posted on the DFO website included individual farm data, and audit data for the farm if applicable – chalimus data (unspiciated was also now included) as well as if farm was treating or harvesting rather than by zone. No further annual reports with interpretation, description of trends and changes were prepared.

4 What are the key findings from the sea lice audit program?

Table 1 summarizes the number of audits done. Audits conducted between 2004 and 2009 found that in 93% of the assessments, there was no statistical difference (at 5% error) in the assessment for motile *L. salmonis* and adult female *L. salmonis* between the farm personnel and the government auditors (BC MAL Annual Reports 2003-2005, 2006, 2007, 2008) indicating that lice were properly identified and enumerated by farm personnel. More importantly, the audit program is used to verify the accuracy of the sea lice data that industry provides to the provincial government on a monthly basis.

Table 1 number of Atlantic salmon farms audited by BCMAL (light gray shading), BC CAHS (no shading) and DFO (dark gray shading) during each quarter: Q1- Jan-Mar, Q2- Apr-Jun, Q3- Jul-Sep, Q4- Oct-Dec.

Year	# Farms Audited for Sea Lice			
	Q1	Q2	Q3	Q4
2004	8	7	11	10
2005	12	25	9	7
2006	9	25	7	6
2007	7	12	2	5
2008	12	30	16	13
2009	14	30	15	15
2010	15	16	15	13
2011	16	15	7	13
2012	12	19	4	6
2013	6	19	6	6
2014	5	20	6	4
2015	6	28	5	6

Assessment of the audit program since DFO took over the program in 2011 found 100% agreement with farm counts between 2011 and 2014. In 2015 (Q1-Q3) however agreement dropped to 85% with the most of the differences in counts observed in Q2. During this quarter, on 3 of 4 farms, significantly higher counts in motile *L. salmonis* were achieved by auditors in comparison to the farmers; on the other farm; the farmers had significantly higher numbers. But in all situations if auditors achieved a mean motile *L. salmonis* count of 3 or greater so did the farms.

5 What are the general findings from monitoring sea lice on salmon farms?

5.1 General findings regarding sea lice on farmed Pacific salmon

Both Chinook and Coho salmon are farmed in British Columbia although at a far smaller scale than Atlantic salmon. Sea lice assessment and reporting requirements on farmed Pacific salmon is less stringent than in the case for farmed Atlantic salmon. Assessments are less frequent and carried out on fewer fish. This was done since Pacific salmon do not deal well with crowding and handling. It can lead to an increase prevalence of diseases such as BKD, or even death due to the handling stress.

Saksida *et al.* (2006) examined the sea lice data collected from farmed Pacific salmon. During the spring, when lice on the farms were to be maintained below three motile *L. salmonis*, the mean abundance reported on farms with Pacific salmon was 0.7. Even without treatment, lice levels on farmed Pacific salmon were maintained at levels equal to or below those observed on farmed Atlantic salmon. Similarly, Ho & Nagasawa (2001) reported that coho salmon farmed in Japan had substantially lower sea lice levels than farmed rainbow trout.

5.2 General findings regarding sea lice on farmed Atlantic salmon

Farms have been routinely reporting sea lice data to DFO since the establishment of the program with the exception of May to October 2012 when routine monitoring was halted due to IHNv detection on some Atlantic salmon farms.

Both *L. salmonis* and *C. clemensi* are found on farmed Atlantic salmon in BC (Figure 1). Motile *L. salmonis* levels on farmed Atlantic salmon tend to fluctuate both temporally and spatially. Motile *L. salmonis* levels generally increase as time spent in sea water increases. This trend has been reported in both wild and cultured salmon and was likely attributable to increased length of exposure (Nagasawa 1985; Bron *et al.* 1991; Tully & Nolan 2002; Revie *et al.* 2002b; Heuch *et al.* 2003; Trudel *et al.* 2007). Saksida *et al.* (2006) reported that levels of *L. salmonis* on Atlantic salmon after more than one year in sea water were 2.5 times higher than those on salmon having spent less than one year in sea water.

Seasonal variation of *L. salmonis* is also evident on farmed salmon. With very few exceptions, *L. salmonis* levels increase in the autumn on farmed Atlantic salmon in British Columbia (Saksida *et al.* 2006, 2007a,b). The lowest sea lice levels are most frequently reported in the summer. Beamish *et al.* (2006) reported that, in one region, prevalence of sea lice infected farmed Atlantic salmon ranged from 85% in February to 46% in August and that the intensity of all lice stages on fish was highest in February (21 lice per fish) and lowest in July (3.3 lice per fish). Orr (2007) looked at gravid female lice levels to estimate egg production from selected farms located in the Broughton Archipelago during 2003/4. He estimated that maximum egg production occurred during November and December and that by January/February

egg production was down by 50%. By March/April, egg production was down to 6% of the maximum estimated levels.

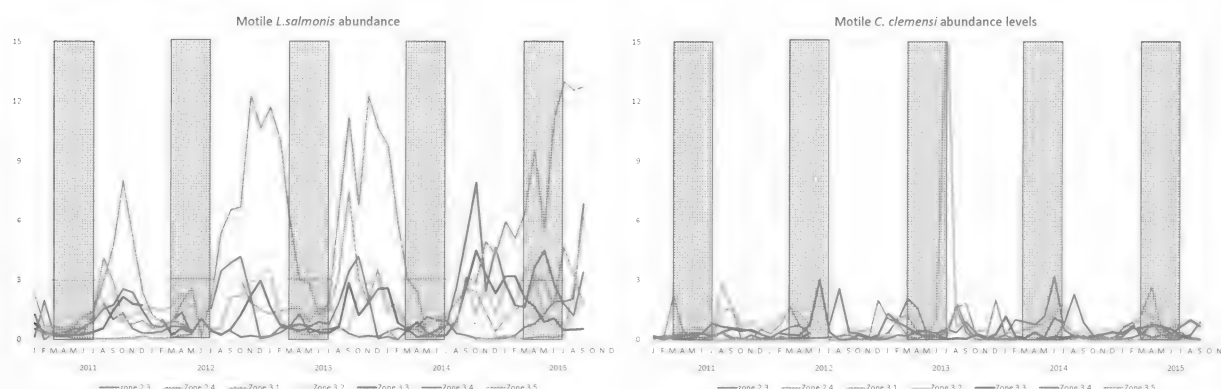


Figure 1 shows the mean motile *L. salmonis* (left) and *C. clemensi* (right) on all farmed salmon and from 2011.

The increase in lice abundance on farmed salmon in the autumn is associated with the return of adult Pacific salmon to their natal rivers (Saksida *et al.* 2006, 2007a; Beamish *et al.* 2005, Marty *et al.* 2010). Direct transfer of motile stages has been reported to occur in situations where host densities are high such as within salmon farms in Europe (Ritchie 1997; Tully & Nolan 2002) and from wild to farmed salmonids in Japan (Ho & Nagasawa 2001).

There is considerable variation in abundance between the fish health zones (Figure 1). It has been suggested that the variation in lice abundance between the different farming regions may be partly related both to the species of wild salmon found in a zone and to their respective abundances (Saksida *et al.* 2006; Jones *et al.* 2006a). Another source of variation in lice abundance between the different farming regions may be *L. salmonis* in the Pacific Ocean have been reported on non-salmonid hosts such as the three-spine stickleback (Jones *et al.* 2006a). The role that these alternate species may play in the natural infestation patterns of sea lice on wild and farmed salmon has not been determined as yet.

Observed regional differences may be linked to environmental factors including differences in temperature and salinity, or to local hydrography (Jones *et al.* 2006a). For example, regions with the highest salinity reported the highest sea lice abundance levels (Saksida *et al.* 2006, 2007a, Elmoslemany *et al.* 2015). Laboratory studies have confirmed associations of environmental factors and lice abundance and in British Columbia there are differences in environmental factors between salmon farming regions or zones.

Changes in salinity and temperature have been reported to affect *L. salmonis* survival and growth rates. Johnson and Albright (1991b) reported that, at salinities of 20 and 25mg/l, the majority of active nauplii died at the copepodid moult stage. Active copepodids were only obtained at 30mg/l. Salinity patterns vary considerably among the different BC regions: for instance, both the west coast regions as well as the Broughton region show annual variation in surface (0-1 m) salinity with the seasons of lowest salinity being reverse to one another. Farms on the west coast of Vancouver Island report lowest levels of salinity in the winter and highest in the summer with a mean difference of 4mg/L (23-27mg/l) (Saksida *et al.* 2006). It has been proposed that the variation may be associated with precipitation, which is

especially high during the fall and winter. Conversely, farms situated in the Broughton Archipelago report highest salinity levels in the winter and lowest in the summer with mean differences of almost 6mg/L reported (range 29-23mg/L)(Saksida *et al.* 2006). The freshwater run-off from snowmelt which occurs in the summer, reduces surface salinity (Foreman *et al.* 2006; Saksida *et al.* 2006, 2007a, b; Beamish *et al.* 2006).

There are significant differences in the primary hydrographic transport mechanisms among the different farming regions in BC likely important in the movement of the plankton stages of sea lice. The primary hydrographic transport mechanisms in the Broughton Archipelago are estuarine flows resulting from considerable river and glacier melt runoff and wind (Foreman *et al.* 2006). These influences were particularly strong in the inlets of the region especially during the summer months when river flow was at its maximum. Wind driven circulation likely plays a significant role in sea lice dispersion (Asplin *et al.* 1999; Murray & Gillibrand 2006). In contrast, the primary hydrographic transport mechanism in the Discovery Islands is tidal with little wind effect (Foreman *et al.* 2012). The significance of these factors around the salmon farms in BC is still not well understood (Rees *et al.* 2015).

Caligus clemensi tends to be the less common (often by many numerical factors) sea louse species occurring on farmed Atlantic salmon (Figure 1), with higher abundance levels occurring in younger farmed salmon populations. *Caligus clemensi* levels show inter-annual variation though there did not appear to be consistent inter-seasonal variation (Saksida *et al.* 2007a). These findings are similar to reports of infestation with *C. elongatus* in Scotland where higher abundance levels were seen in younger salmon populations but differ in that the authors noted consistent levels from year to year (Revie *et al.* 2002a; McKenzie *et al.* 2004). Regional differences in abundance levels of *C. clemensi* between farming regions in BC have been observed.

5.4 How has compliance to the 3 motile *L. salmonis* threshold during the suggested “critical” period (March to July) been?

From 2011 to 2014, there was approximately 95% compliance of farms maintaining levels below 3 motile *L. salmonis* during the ‘critical’ period. However in 2015, there was a decrease in compliance to 76%. Twenty-six farms reported levels equal or great than 3 motile *L. salmonis* in at least one month between March and July. This occurred in all zones except for 3.1. The last time a similar event was observed was in 2004 (Figure 2).

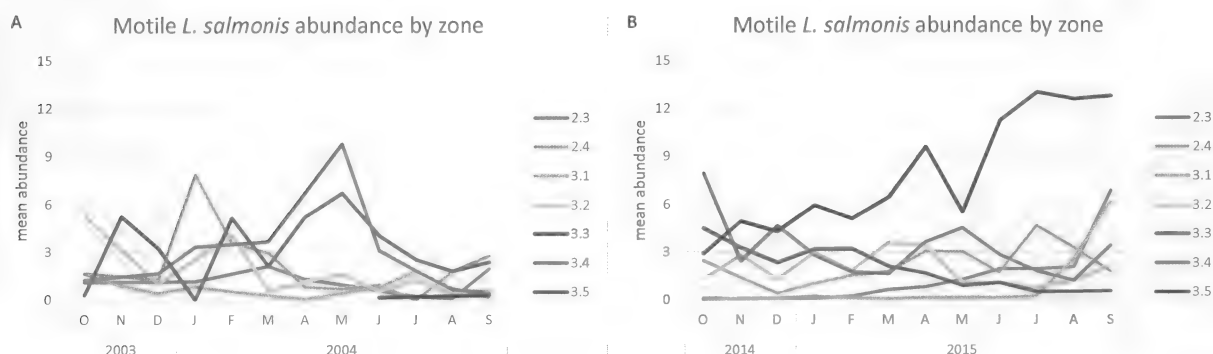


Figure 2 shows the motile *L. salmonis* abundance by zone for the periods October to September 2003/4(A) and 2014/15 (B).

5.4.1 How does 2014/2015 compare to 2003/04?

The higher than expected motile *L. salmonis* thresholds observed in the spring 2015 in six farming regions, although unusual to most years, was similar to events observed in the same period in 2004 (Figure 3). In 2004 there were two regions affected: Broughton (farms in zone 3.3 and 3.4) and the West Coast of Vancouver Island (zone 2.4). Marty *et al.* (2010) reported that Spring 2004 had the largest total number of adult sea lice on all farms in the Broughton Archipelago in their 10 year study.

More regions appear to have been affected in the 2014/15 event however it should be pointed out that in 2003/04, many regions were in the midst of cleaning up following the IHNv outbreak (2001-2003) and as a result many farms were fallow in Tofino and Port Hardy during this period. In the Discovery Island region, companies had switched to Chinook salmon for one rotation. In Klemtu, many of the farms were still rearing Chinook salmon although the switch to Atlantic salmon had started.

When lice data from individual farms are compared, it becomes apparent that the abundance of *L. salmonis* was higher in the 2004 than 2015 for the affected farms in both the west coast Vancouver Island and the Broughton Archipelago (Figure 3). The period where the elevation numbers were observed however appears to be similar between the years.

The cause of this unusual event is unknown though both climatic (precipitation, temperature, salinity) and/or biological (spike in an unknown host) factors have been suggested. For instance 2014/15 had low rain fall and winter snow packs. Higher salinity and water temperature have been shown to

improve louse survival and rate of development. This may have improved overwintering survival of the lice.

It has also been suggested that high number of returning adult salmon may have also played a role, this however would have to be further investigated. In 2004, the spring spike in *L. salmonis* observed was despite a fairly low return of Pinks salmon into the Broughton Archipelago in 2003 (Figure 4) but the odd-year Pink salmon run to the Fraser River was exceptional. In fact the Pacific Salmon Commission estimated the amount of Pink salmon returning to the Fraser River in 2003 was 26,000,000: largest Pink salmon escapement since 1959. Conversely the 2014 spike was associated with moderate to good Pink salmon escapement to the Broughton Archipelago (Figure 4) and no Pink salmon returning to the Fraser River (no even year stocks). Interestingly, even though lice numbers on farms and juvenile Pink salmon (Jones & Hargreaves 2007) were elevated in the spring of 2004, the subsequent return of these populations as adults (2005) was better than their parents (2003) (Figure 4) (Van Will 2015).

Pink salmon are also unlikely the cause for the spike observed on the west coast (zones 2.3, 2.4) as there are few to no Pink salmon runs in the area.

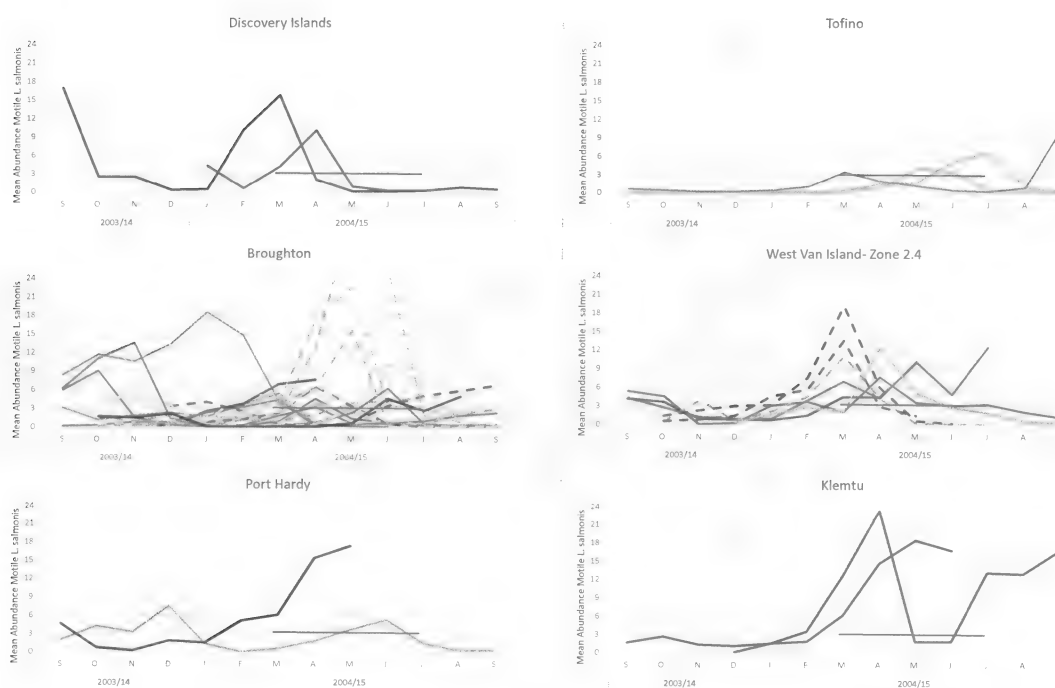


Figure 3 shows the mean motile *L. salmonis* abundance by farm that reported thresholds levels above 3 motile lice during the critical period (March to July) in 2004 (dashed lines) and 2015 (solid lines) for each zone. Note no farms were over threshold in zone 3.1.

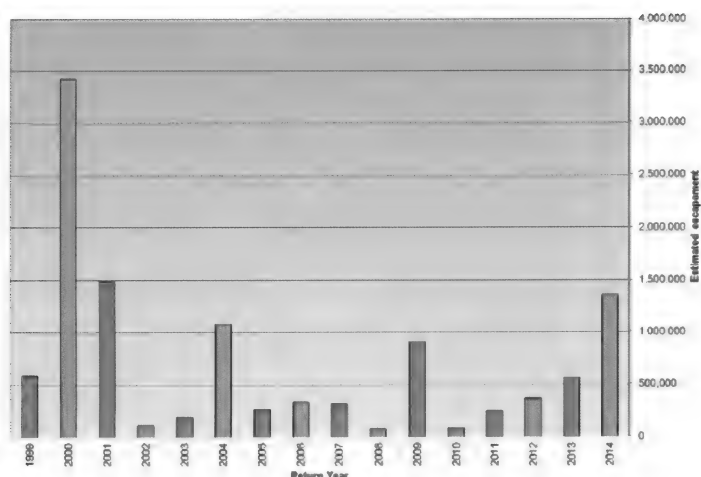


Figure 4 Estimated escapement of adult Pink Salmon returning to Broughton Archipelago Rivers.

5.5 What can be said about sea lice treatment in British Columbia?

SLICE® became available to veterinarians under special permit, called an emergency drug release or EDR, obtained from Health Canada in December 2009 and gained full registration approval in July 2009 with a recommended withdrawal period of zero days, though the industry continues to apply longer withdrawal periods.

SLICE® became the only therapeutant used for sea lice treatment in British Columbia. A concern for the BC salmon farming industry has been the inherent limitation of having only one sea lice treatment product available for use. This differs from other agricultural industries which utilize integrated pest management, (a rotation of treatments) to prevent or delay development of resistance in a pathogen.

There was an increase in use of SLICE® since the introduction of the threshold limits with quantities in 2005 reporting levels over 2.5 times greater than levels that existed prior to implementation of the BC Sea Lice Management Strategy in 2003 (Figure 5). Peak use of SLICE occurred in 2005, 2010 and 2011 (~0.26 g/ metric ton (MT) of salmon produced). Usage other times as been at or below 0.2 g/ MT.

The total number of SLICE® treatments for Atlantic salmon ranged from zero to three per production cycle (i.e. smolt entry to harvest) (Saksida *et al.* 2006, 2007a). Additional data reported in Saksida *et al.* (2010) suggest that frequency of treatment has not changed over the first five years since the establishment of the maximum threshold levels.

Concerns regarding SLICE® treatment failures, reduced sensitivity and/or potential resistance have been confirmed in Scotland, Ireland, Chile and Norway (Lees *et al.* 2008a,b; O'Donohoe *et al.* 2008; Bravo *et al.* 2008; Aaen *et al.* 2015). Saksida *et al.* (2010) conducted a similar analysis with data collected from farms in British Columbia from 2003 to 2008 and found that there has been no change in the efficacy of the emamectin benzoate's (EMB, active ingredient of SLICE®) apparent duration of effect. Treatment

efficacy and EMB bioassays also suggested that sea lice continued to be susceptible to the product (Saksida *et al.* 2010; Saksida *et al.* 2013) although regional differences are seen.

A recent modelling study has demonstrated that the presence of a large un-treated 'refugia' of wild fish should indeed likely retard the development of tolerance within sea lice populations (McEwan *et al.* 2015). However, increasing the number of treatments per cycle, one consequence of adopting a reduced sea lice threshold, is one of the key drivers of selection for resistance. There is evidence to suggest that tolerance can build even after three treatments and more rapidly in adult male than female sea lice. This may be because males are more motile – capable of more easily swimming off the host and reattaching than females. Alternatively males are hardier as they need to expend less energy in reproduction.

Evidence of tolerance have now been observed and as a consequence Hydrogen Peroxide bath treatments, under an Emergency Registration from the Pest Management Regulation Agency (PMRA), have been used four times in BC (in 2014 and 2015). Treatment successfully reduced sea lice on the affected farms (in zones 2.4 and 3.5). This exemplifies the need a re-evaluate of the current regulations and ensure appropriate management of sea lice and avoid unnecessary treatments which could lead to resistance or have impacts on non-target organisms.

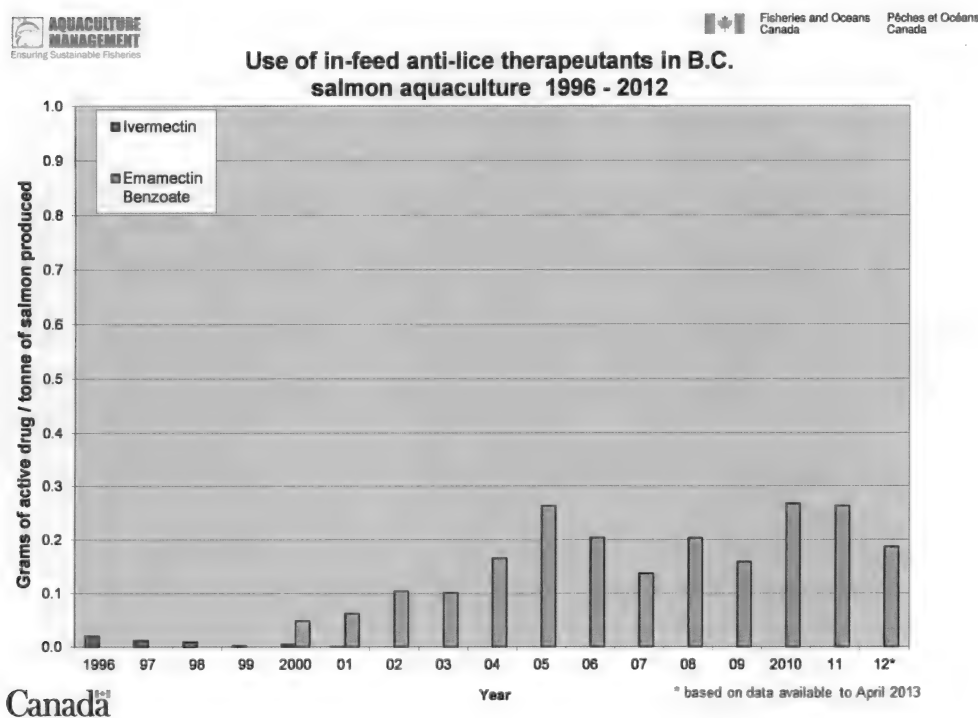


Figure 5 anti-parasitic use by BC aquaculture.

6 What have we learned about sea lice and wild juvenile Pacific salmon in the last decade?

6.1 On individual salmon

Sea lice have also been reported on all species of juvenile salmon in the marine environment and vary among species (fish and louse species), by geographic location, environment, length of time in seawater and annually (Trudel *et al.* 2007, Rees *et al.* 2015, Elmoslemany *et al.* 2015) (see Saksida *et al.* 2015 for summary). Sea lice have been reported on juvenile Pink and Chum salmon shortly after emergence from the river into the marine environment as small as 0.2g. Preponderance of *L. salmonis* versus *C. clemensi* varied spatially and temporally (Patanasatienkul *et al.* 2015).

Caligus clemensi was reported to be the predominant louse species on juvenile Sockeye salmon in the Discovery Islands and north coast in a 2 year study (Price *et al.* 2011) and Southern Gulf Islands (Beamish *et al.* 2009); while in one area of the west coast of Vancouver Island fish were almost exclusively infested with *L. salmonis* (Elmoslemany *et al.* 2015).

A considerable amount of research has centered around the health implications of sea lice on individual juvenile salmon particularly Pink salmon. There appears to be now consensus of minor skin lesions associated with sea lice attachment on naturally infected Pink and Chum salmon (Saksida *et al.* 2012, Jakob *et al.* 2013) and the bleeding at the base of the fins noted in Morton & Routledge (2005) was not in fact associated with sea lice but more likely the associated with stressful environmental conditions or bacterial and viral infections in the wild captured juvenile salmon (Marty *et al.* 2010). However Sockeye salmon when exposed to high levels of adult *L. salmonis* in controlled laboratory trials did exhibit signs of epithelial grazing and parasite-induced damage were not observed on Coho or Atlantic salmon (Branden *et al.* 2014).

The presence of sea lice does not hinder swimming performance in Pink salmon (Nendick *et al.* 2011). A 'no effect' threshold for sublethal disturbance has been reported to as 0.5 g with one chalimus 4 is consistent with the developmental stage at which Pink salmon develop scales and exhibit a heightened immunocompetence (Sackville *et al.* 2011; Brauer *et al.* 2012). Furthermore controlled laboratory studies found the lethal level for Pink salmon weighing less than 0.7g to be 7.5 *L. salmonis*/g. Above this size Pink salmon appear to be highly resistant to lice (Jones *et al.* 2008) though they do appear to become more sensitive upon sexual maturity (Braden *et al.* 2014).

Naturally infected juvenile chum salmon had higher intensities of infection with *L. salmonis* compared with Pink salmon (Jones & Hargeaves 2007, 2009). The latter pattern was repeated in laboratory exposures in which the parasite was rapidly rejected from juvenile Pink compared with juvenile Chum salmon (Jones *et al.* 2006b, 2007). The consensus is that juvenile chum salmon and Atlantic salmon are more susceptible to *L. salmonis* than Pink salmon (Sutherland *et al.* 2014).

Pink salmon and Coho salmon have been found to reject sea lice (*L. salmonis*) at higher rates than chum, Chinook and Sockeye salmon (Jakob *et al.* 2013). *L. salmonis* mature more slowly on Coho salmon than on rainbow trout or Atlantic salmon and concluded that Coho salmon had a relatively high innate

immunity to *L. salmonis* (Johnson & Albright 1992); Fast *et al.* 2002) and therefore would likely not to be negatively impacted when preying on juvenile salmon carrying lice as suggested by Connors *et al.* (2010).

In summation studies have demonstrated that juvenile Pink and Coho salmon are the most resistant to *L. salmonis* while Sockeye, Chum and Atlantic salmon are less so. Chinook salmon tolerance to *L. salmonis* is situated somewhere in between these two groups.

6.2 On a population scale

Considerable research has also centered around population level effects of sea lice and there continues to be two distinct opinions.

One group suggested that as much as that 90% of Pink and Chum salmon in the Broughton Archipelago were infected at or above lethal limit which they suggested were 1.6 mobile lice/g (Morton *et al.* 2004) and inappropriately forecasting the extinction of Pink salmon populations in the Broughton Archipelago (Krkošek *et al.* 2007). Some criticized the reports based on them attributed population level declines on evidence of association not causation, using a flawed mortality study (Morton *et al.* 2004) to calculate mortality rates and often did not differentiate sea lice species (Morton *et al.* 2004, 2011; Krkošek *et al.* 2005, 2006a,b, 2007) or compare areas that were very different from one another (Ford & Meyers 2008). Several of the same authors who had predicted a collapse of wild Pink stocks later published a report indicating that survival of Pink salmon stocks in the Broughton Archipelago did not statistically differ from a reference region without farms (Morton *et al.* 2011) and suggested that winter treatments on farmed fish for sea lice and following the current threshold criteria lead to lower lice abundance on out-migrating juvenile wild Pink and Chum salmon in the Broughton Archipelago (Peacock *et al.* 2013). Suggesting that perhaps the sea lice program at its current state was in fact effective for the Broughton Archipelago.

Other researchers however incorporated results from published controlled lab study results into their analysis and suggested that *L. salmonis* induced mortality ranged from 0 to 4.5% for the same periods reported above, leading these authors to conclude that sea lice related mortality contributed only minimally to the overall mortality normally experienced during this life-stage (55-77%) of Pink salmon (Jones & Hargreaves 2009). Marty *et al.* (2010) reported that the number of Pink salmon returning to spawn in the fall predicts the number of female *L. salmonis* on farms in the next spring and in turn accounts for 98% of the variation in sea lice prevalence seen in the out-migrating juvenile salmon in the Broughton Archipelago. Suggesting the higher the return numbers of the Parent population, the higher the lice levels on corresponding juvenile offspring of Pink salmon during their outmigration but there is no correlation with lice levels of on the juvenile salmon and their subsequent return levels as adults (i.e. population survival rate). This research suggests that sea lice at current levels (including those seen in 2004) may not be affecting Pink salmon populations in the Broughton Archipelago.

7 What have we learned about alternative hosts for sea lice?

Three-spine stickleback, a very abundant nearshore species in British Columbia have been found to host *L. salmonis* to the pre-adult stage (Jones *et al.* 2006a, Jones & Prosperi-Porta 2011). Pert *et al.* (2009) suggested successful settlement and feeding on non-salmonids allowed *L. salmonis* to use other species as peripatetic (or paratenic / transport hosts) to improve survival and to aid dispersion until a salmonid host is encountered.

Many non-salmonids are commonly known to host *C. clemensi* particularly Pacific herring and three-spine stickleback. They may act as a year-round reservoir for this species of louse.

8 What can we say about the salmon and sea lice in BC?

The ratio of wild adult salmon to farmed salmon in British Columbia is ~ 1000:1 (Saksida *et al.* 2015). The ratio of wild juvenile salmon (smolts) to farmed salmon must be significantly higher since as estimated survival rates (smolt to adult) range from 0.7% for Chum to 9.8% for Coho (Bradford 1995). Sea lice and fishes co-evolved, so infestations in wild salmonid and non-salmonid fishes are a natural phenomenon. Transmission of sea lice between and within wild fish populations and salmon farms occurs, however, the dynamics of transmission will depend on a multitude of environmental and biological factors, and will be site and time-dependent. Sea lice dynamics (i.e., development and survival) are influenced by salinity and water temperature (which affect survival, growth, development rate, and reproductive success of sea lice), water movement (tides and currents), behaviour of infective larval stages and motile pre-adult and adult stages, and the abundance and proximity of suitable fish hosts.

9 What can we say about the sea lice monitoring program?

Sea lice monitoring programs currently in use in BC for both farmed and wild fish have demonstrated that farming regions in BC vary in both ecology and environment and existing program may not be appropriate for all areas. The original program was to address specific concerns in one farming region; specifically what lice sea from farms operating in the Broughton Archipelago could be having on juvenile Pink (and to a less degree Chum) salmon during their out-migration. The program was designed using precautionary principles to address this concern while research on topic could occur. This program was then expanded to all the other farming regions without any acknowledgement of environmental and biological differences between areas (i.e. temperature/salinity differences, hydrography, wild salmon species present, migration timing). Now that there is more understanding of the affects that lice have on the different species of wild Pacific salmon, the period of risk it is perhaps time to re-evaluate and re-

develop the program. It is possible that the thresholds, the critical period and the reporting scheme may actually have contributed in tolerance issues developing in certain farming areas.

The program and its objectives need to be re-evaluated and revised based on the data that has been collected. It must be noted that any sea lice monitoring and management program should be for *L. salmonis* alone since salmon are the predominant host for this species of louse.

The results from the sea lice program has demonstrated the importance of integrated pest management programs (IPM) as part of ensuring success of a health management program. When the program was established there was only one therapeutant registered for use for the treatment of sea lice. After 12 years there continues to be only one registered product. Establishing mandatory treatment thresholds, across all the regions, without providing options to rotate products could have resulted in the tolerances that are starting to be seen in some regions. In these areas hydrogen peroxide has been made available but requires an Emergency Release for results in treatment delays. Any management program should include IPM options. And as long as there are applied thresholds and critical periods, DFO should support the use of other products to ensure that resistance does not become a wide spread problem

The current policy of reporting of raw data without context is also a concern. Annual reports with interpretation were no longer prepared. Reporting individual farm data to public with no interpretation may not be helpful to the program. The current policy of reporting farm level data may actually be having a potential a negative impact on health management on farms. DFO should also prepare papers for publication of the data collected.

Current the department operates an audit program on a year round basis. This component of the program is likely cost. The department may want to investigate in targeting program to the 'critical' periods. The department may want to set up a sea lice training program for the farmers if there is a concern with identification.

Aquaculture management policy of managing farms to peak biomass rather than total production and also allowing for farms to increase production in lieu of opening up new tenures may be altering the sea lice dynamics with an area and affecting long term management capabilities. Furthermore it is possible that using the peak biomass may result in more fish staying in the water for a longer period. And as the data has shown, lice abundance increases with length of time in seawater.

Finally, the sea lice data has shown that farms could act at a sentinel to study what is going on in the surrounding environment – e.g. high *L. salmonis* in the fall suggests good wild salmon returns, high *C. clemensi* could indicate an abundance of herring or some other natural host for this louse species. This could play an important role in determining locations for new farming licenses.

9.1 What are the objective of the sea lice program in BC?

There are two possible objectives for the current program in British Columbia

9.1.1 To protect wild juvenile salmon during their outmigration

The initial program was designed to 'protect' juvenile Pink (and Chum salmon) from sea lice (specifically *L. salmonis*) from farms in the Broughton Archipelago. Timelines and thresholds were then expanded to other regions.

Has this objective been achieved? For what species? How is success measured? What is the benchmark for this?

9.1.2 To provide public confidence that sea lice are being appropriately managed on farmed salmon in BC

Initially, under the province, program rolled up the data to zones, zone level sea lice data was published on the website. Summary and interpretation of the results (including fish health), including audit data compliance was provided in an annual report.

Once under DFO control – farm level data was posted on the website, with no interpretation or summation.

Has this objective been achieved? Probably not. The program results have not been well communicated. The raw data without any context or interpretation simply allows for those opposed to cherry pick data and interpret data. For example by showing individual farm data – the high lice levels seen in the autumn may provide an impression of mismanagement of the issues.

9.2 What are some options for the program going forward?

It would be strongly recommended that a panel of experts be convened which include veterinarians, DFO biologists, Stock assessment specialists and oceanographers to develop the framework for a new program. Listed below are a few options to consider; this however is not an exhaustive.

9.2.1 Disband the program

9.2.2 Maintain existing program as is

Current program is expensive and based on research it should be redesigned to provide service to both the public and the ecosystem.

9.2.3 Maintain present threshold but only during critical time of juvenile out migration

The rest of the year farms are allowed to manage based on their own health needs.

Science questions

For each area what are the species of interest? And when are they susceptible?

What is the timing of their migration? What is the critical period? How much variability is there in the timing?

Is there a way to predict a change in emergence in advance to be able provide farms enough time to meet the threshold at the appropriate time? It maybe science could provide a forecast as these periods would likely vary based on climatic influences (does DFO science have this kind of information?) Could it be collected if not?

Management questions

Has there been a shift in treatment timing since the onset of farm level reporting?

Advantage

- Farm level management maintained
- Fish that migrate past one farm will have equal probability of being exposed to a similar number of lice than fish migrating past another farm. (i.e. 3 motile/fish or less)
- Program continuity is maintained (for the period of concern)
- Audit program could just occur during period of interest.

Disadvantage

- May have to establish new siting criteria. Restrict increase biomass on sites that have issues with sea lice management. Restrict new sites in areas where lice management difficult

9.2.4 Establish maximum lice numbers thresholds for farms during critical periods.

For example standard farm has 500,000 fish and currently maximum number of lice per fish must not exceed 3 motile lice (or 1.5 Million motile lice/ farm) (Table 2).

Table 2 shows an example of the number of lice permitted on farm based on using a total motile sea lice threshold

Number of fish on farm	Abundance of motile <i>L.salmonis</i>	Number of lice/farm	Comment
500,000	3	1,500,000	maximum allowable during outmigration period for a farm
250,000	6	1,500,000	if harvesting # can increase as long as still maintain below the 1.5 million lice
750,000	2	1,500,000	If farm has more fish than the number of lice per fish is reduced

Science questions (in addition to those listed in 9.3.3)

What is a reasonable threshold for farms within each area?

Management questions

How will the new program be monitored/audited/reported to ensure accuracy in production numbers?

Advantage

- May require less therapeutant use since farms harvesting may be able to maintain total threshold just by harvesting.
- Farms with larger number of fish are usually holding smolts which have fewer lice.

Disadvantage

- Will need to develop mechanisms to ensure accuracy in production numbers
- Will need to modify how data areas reported and broadcasted.

9.2.5 Switch to Area Management rather than Farm-level management.

An argument could be made that a better model for a threshold could be establishing a threshold for a specified area/region (either based on lice levels or biomass) rather than a per farm limit (see table 3).

This could result in a more prudent use of the therapeutant and overall better management of an area.

Table 3 illustrates change in treatment requirements if area based management was implemented rather than by farm thresholds

Area consisting of 3 farms	No. of fish on a farm	Average size of fish (kg)	Abundance of motile <i>L. salmonis</i>	Scenario 1 – current farm level threshold	Scenario 2 – area based thresholds (3/fish/area) - now abundance only 1.7/fish/area
1	500,000	5	3	Treatment required	no tx required
2	500,000	1	1	no tx required	no tx required
3	500,000	1	1	no tx required	no tx required

Science questions (in addition to those outlined in 9.3.3).

What are these areas?

Will there be areas for different diseases?

What is the threshold lice level for the area?

What is the maximum number of farms (fish) within an area? (Capacity)

Management questions

How will the new program be monitored/audited/reported?

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Advantage

- May require less treatment to maintain area threshold
- Audit program could be adjusted so areas are selected for audit not farms – could mean less travel. This program could target period of interest.

Disadvantage

- There could be farms with greater than 3 motile/fish
- Increase risk for fish that swim past or downstream of farms with great than 3 motile lice/fish
- May have to establish new siting criteria. Restrict increase biomass on sites that have issues with sea lice management. Restrict new sites in areas where lice management difficult
- Reporting and compliance offences may need to be modified.

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ⁱ Active farm is on with salmon populations in seawater for greater than 1 month. Did not include broodstock farms.

From: Rainer, Michelle
To: Waddington, Zac
Subject: RE: Media request on sea lice
Date: May-04-18 3:19:53 PM

Perfect, thanks Zac. I also made this change:

The province has granted Cermaq Canada a permit for the use of Paramove. Please contact Cermaq or the BC Ministry of Agriculture for further information on this process.

From: Waddington, Zac
Sent: May-04-18 3:11 PM
To: Rainer, Michelle
Subject: RE: Media request on sea lice

Thanks very much for drafting those. I made one small but important change, since peroxide is being used elsewhere in BC already.

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath).
- Cermaq has applied for a permit but has not yet obtained one from the province of BC. Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.
- Hydrogen peroxide is used widely world-wide, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment, causing no discernible far-field effect.
- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

Zac

From: Rainer, Michelle

Sent: May-04-18 2:51 PM
To: Waddington, Zac
Subject: RE: Media request on sea lice

Thanks, Zac. There is a press release (forwarded separately) and 2 media requests so far. I have added to your input using some lines from a previous exceedance event. How about:

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
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- Cermaq has applied for a permit but has not yet obtained one from the province of BC. Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.
- Hydrogen peroxide is used on Canada's east coast and elsewhere in the world to remove sea lice from cultured fish. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment, causing no discernible far-field effect
- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

From: Waddington, Zac
Sent: May-04-18 2:31 PM
To: Rainer, Michelle
Cc: Sandberg, Krista; Keith, Ian
Subject: RE: Media request on sea lice

Very interesting timing. We are indeed aware of this and I just finished chatting with Ian about the lice management in Clayoquot and first thing next week we are meeting [REDACTED]
[REDACTED] The waters are muddied a bit since they submitted a series of plans for sites over threshold back in Jan and Feb which involved the use of Paramove (peroxide). However, the use of Paramove requires a Pesticide Use Permit, issued by the province. This was expected to be in place before the outmigration period, but is still pending. So Cermaq moved to harvesting as a management action, which is acceptable; [REDACTED]
[REDACTED]

s.21(1)(a)

s.21(1)(b)

So the short answer is that they are over, we don't yet know if they can be held at fault for this. They also had some sub-par SLICE treatments which has further exacerbated the lice problem.

I'm not sure what more we can/should say about it at this time. Perhaps the best thing to say is:

"DFO regulators are aware of the lice exceedances in Clayoquot and have been in ongoing discussions with Cermaq since the beginning of 2018. Cermaq has faced challenges with attaining a Pesticide Use Permit for Paramove (hydrogen peroxide bath), which is within provincial jurisdiction. DFO strongly encourages an Integrated Pest Management approach to sea lice management, and a key component of that is the availability and rotational use of numerous lice control techniques. The public opposition to the use of hydrogen peroxide is ill-founded and directly impacting the effective management of lice by salmon farmers [I understand if you don't want to include this last sentence- but it's true].

We cannot comment further at this time since the management of lice at farms in Clayoquot by Cermaq is currently being investigated to determine if there has been non-compliance with the licence conditions. "

This should definitely be reviewed by Adrienne and Allison before going out.

Zac

From: Rainer, Michelle
Sent: May-04-18 1:37 PM
To: Waddington, Zac
Cc: Sandberg, Krista
Subject: Media request on sea lice

Hi Zac,
Can you help with this request today? Or Krista? Sorry, busy day!
Thanks,
Michelle

From: [REDACTED]
Sent: May-04-18 12:19 PM
To: RHQ - Media.PAC
Subject: CBC News request

Hello,

The current reporting for sea lice at Cermac Canada salmon farms in Clayoquot Sound shows levels well over the threshold for treatment at about half of the 14 farms. I'm seeking comment on whether this is a concern and whether it could impact wild salmon in the area.

Thanks,

s.19(1)
s.21(1)(a)
s.21(1)(b)


CBC Victoria

Phone: 

Cell: 

s.19(1)

No further information has been removed or severed from this page

Delaney, Paula

From: Rainer, Michelle
Sent: May-04-18 3:26 PM
To: Doucette, Claire; Webb, Allison
Subject: URGENT: sea lice media lines for approval

Importance: High

Hi Allison,

Can you please review ASAP? Claire, I just want to make sure it's OK to use the word "investigating" in this case; I know there are specific instances in which we're supposed to use it.

Thanks,
Michelle

Issue: [REDACTED] CBC Victoria [REDACTED]
Parksville Qualicum Beach News, [REDACTED]. Looking for response on high levels of sea lice reported at Cermaq Canada farms in BC's Clayoquot area. See press release issued May 5 by Clayoquot Action Campaigns, provided below.

Deadline: Friday, May 5, 4:00 p.m. PST

Recommendation: email approved response

Approved by: Zac Waddington

Media lines:

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath).
- Cermaq has applied for a permit but has not yet obtained one from the province of BC. Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.
- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.

- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

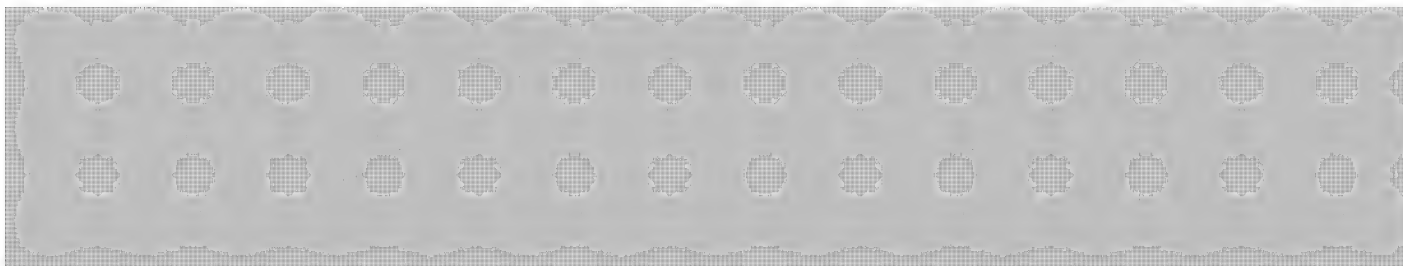
Available at <https://www.wildfirst.ca/clayoqout-action-salmon-lice-outbreak-could-devastate-clayoquot-salmon/>

FOR IMMEDIATE RELEASE:

Salmon lice outbreak could devastate Clayoquot salmon



s.68(a)



-30-



High res photos of Clayoquot May 2018 juvenile salmon with lice and Cermaq salmon lice graphs available here:

<https://drive.google.com/drive/folders/1ps-GumjM4j7RmsYT-kVu1GjJR2oiltqz?usp=sharing>

Cermaq's public reporting webpage: <https://www.cermaq.com/wps/wcm/connect/cermaq-ca/cermaq-canada/our-promise/public-reporting/>

s.19(1)

s.68(a)

Paylor, Adrienne

From: Blasco, Nathan
Sent: May-07-18 8:20 AM
To: Paylor, Adrienne
Subject: RE: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

I can work on finishing it today and probably have it complete, or at least some sort of simple report complete. Can you call me asap 250-286-5826

From: Paylor, Adrienne
Sent: Monday, May 07, 2018 8:17 AM
To: Blasco, Nathan; Sandberg, Krista; Waddington, Zac
Subject: FW: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

We are briefing up as a result of the media inquiry below so will need more info for Andy and RDG.
Adrienne

From: Webb, Allison
Sent: Friday, May 04, 2018 5:02 PM
To: Paylor, Adrienne
Subject: FW: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Thomson, Andrew
Sent: 2018-May-04 4:35 PM
To: Webb, Allison
Subject: Fw: URGENT: sea lice media lines for approval

Will need to send an email to RDG on the issue as well. Can you do up a short summary of how bad the levels are and what's being done about it.

When did we post the sea lice numbers - is this something we should have flagged as likely to cause attention?

Andrew J L Thomson

Regional Director | Directeur Régionale
Fisheries Management Branch | Direction de la gestion des pêches

Pacific Region | Région du Pacifique
Fisheries & Oceans Canada | Pêches et Océans Canada

Suite 200 – 401 Burrard St.
Vancouver, BC, Canada V6C 3S4
andrew.thomson@dfo-mpo.gc.ca
Telephone | Téléphone 604.666.0751
Facsimile | Télécopieur 250.666.8069
Government of Canada | Gouvernement du Canada.

From: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Sent: Friday, May 4, 2018 4:27 PM
To: Thomson, Andrew
Cc: Bate, Dan; Girouard, Louise
Subject: URGENT: sea lice media lines for approval

Hi Andy,
Sorry for all the “urgents” today! Can you please review ASAP? Please cc Dan and Louise on response.
Thanks,
Michelle

Issue: [REDACTED] CBC Victoria ([REDACTED])
Parksville Qualicum Beach News, [REDACTED]. Looking for response on high levels of sea lice reported at Cermaq Canada farms in BC's Clayoquot area. See press release issued May 5 by Clayoquot Action Campaigns, provided below.
Deadline: Friday, May 5, 4:00 p.m. PST
Recommendation: email approved response
Approved by: Zac Waddington, Allison Webb, Claire Doucette

Media lines:

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
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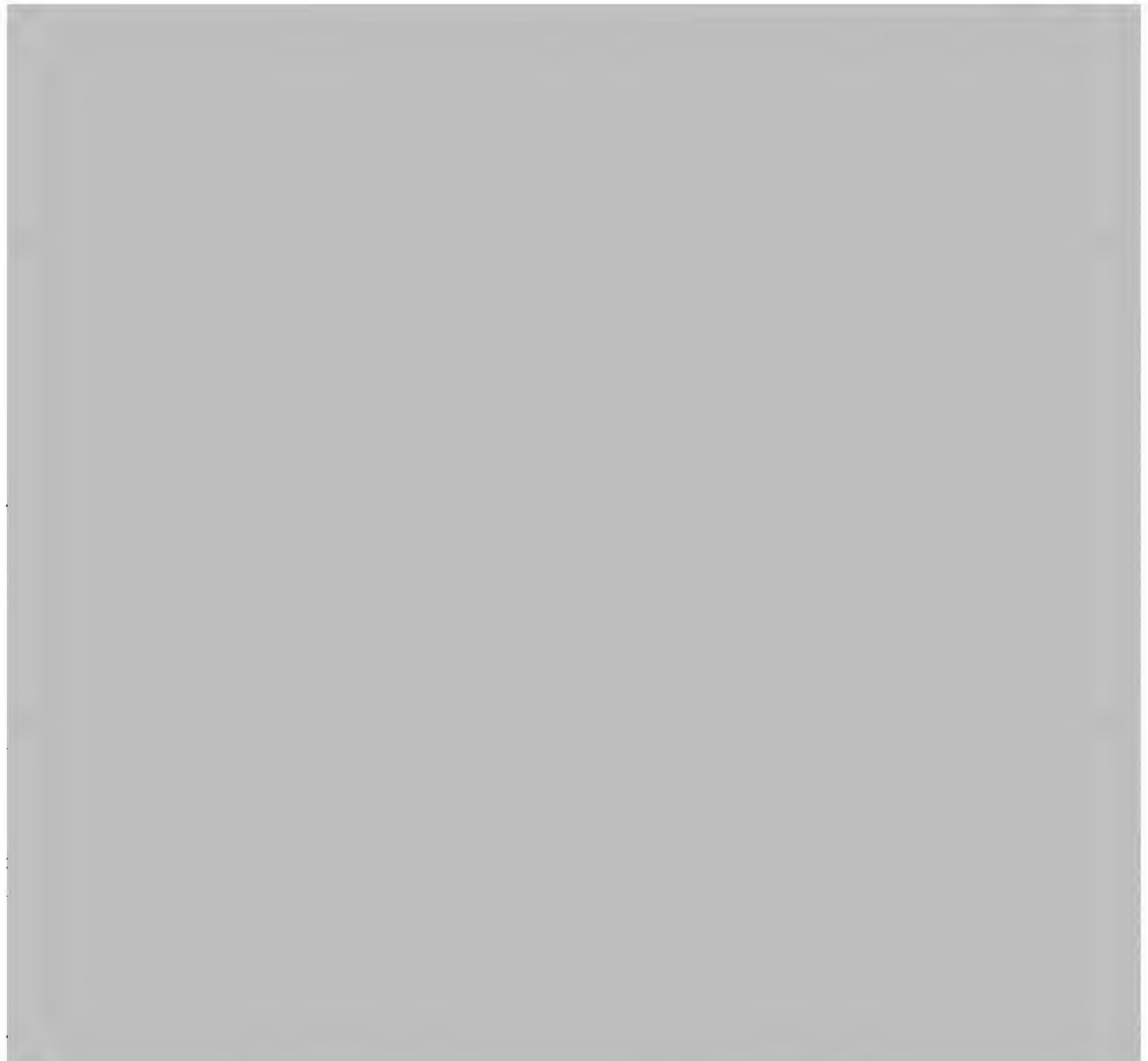
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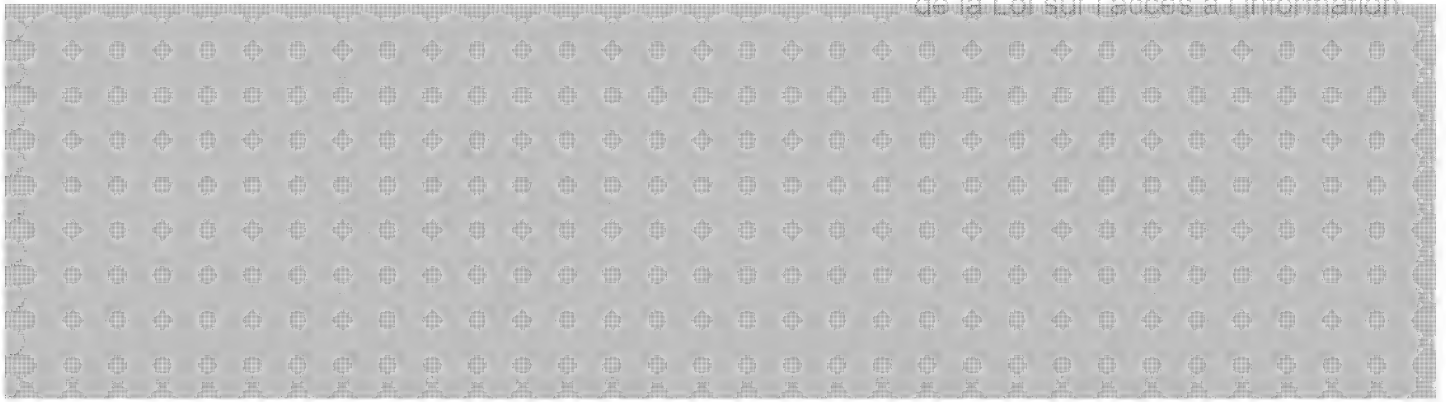
- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
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Available at <https://www.wildfirst.ca/clayoquot-action-salmon-lice-outbreak-could-devastate-clayoquot-salmon/>

FOR IMMEDIATE RELEASE:

Salmon lice outbreak could devastate Clayoquot salmon





-30-

Clayoquot Action

High res photos of Clayoquot May 2018 juvenile salmon with lice and Cermaq salmon lice graphs available here:

<https://drive.google.com/drive/folders/1ps-GumjM4i7RmsYT-kVu1GjJR2ojltqz?usp=sharing>

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s.19(1)

s.68(a)

Delaney, Paula

From: Paylor, Adrienne
Sent: May-07-18 9:38 AM
To: Webb, Allison
Cc: Waddington, Zac
Subject: FW: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

Zac has provided a summary below related to briefing up Andy (I know you send something Friday night but I'm sure this will be ongoing). As my other email this morning indicated the media inquiry came from Cermaq's own posting and likely [REDACTED] sampling. We are just in the process of posting our Audit and industry reported numbers on sea lice for March 2018 today.
Adrienne

From: Waddington, Zac
Sent: Monday, May 07, 2018 9:27 AM
To: Paylor, Adrienne
Subject: RE: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

Here's a brief summary of my understanding of the situation to date. Please forward or edit as you wish.

Based on the first article I was sent from Michelle R., it looks like this was initially brought to the media's attentions by Cermaq's own reporting (see : <https://www.cermaq.com/wps/wcm/connect/cermaq-ca/cermaq-canada/our-promise/public-reporting/>). We have been aware of the ongoing issues with sea lice management in Clayoquot. The use of SLICE has had sub-par effects, and so lice control with that product is not currently an option. The public opposition to peroxide has prevented the use of this product in Clayoquot up to this point. Therefore, the only management action left to Cermaq was harvesting, which they committed to doing at the capacity of the plant beginning in February. We would like to confirm that they indeed have met this commitment, [REDACTED]

Based on other incidences when farms have been above threshold during the outmigration, it does seem to be correlated with elevated lice numbers on out-migrating smolts. The species of salmon known to be in the area of (all except pinks), are known to be highly resistant to lice infection which is fortunate. [REDACTED]

Zac

s.19(1)

s.21(1)(a)

s.21(1)(b)

From: Paylor, Adrienne
Sent: May-07-18 8:17 AM
To: Blasco, Nathan; Sandberg, Krista; Waddington, Zac
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From: Webb, Allison
Sent: Friday, May 04, 2018 5:02 PM

To: Paylor, Adrienne

Subject: FW: URGENT: sea lice media lines for approval - so sorry - need your help with this. My apologies, but please call me and I can type up.

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Thomson, Andrew
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Will need to send an email to RDG on the issue as well. Can you do up a short summary of how bad the levels are and what's being done about it.

When did we post the sea lice numbers - is this something we should have flagged as likely to cause attention?

Andrew J L Thomson

Regional Director | Directeur Régionale
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Suite 200 – 401 Burrard St.
Vancouver, BC, Canada V6C 3S4
andrew.thomson@dfo-mpo.gc.ca
Telephone | Téléphone 604.666.0751
Facsimile | Télécopieur 250.666.8069
Government of Canada | Gouvernement du Canada.

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Sent: Friday, May 4, 2018 4:27 PM
To: Thomson, Andrew
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Hi Andy,
Sorry for all the "urgents" today! Can you please review ASAP? Please cc Dan and Louise on response.
Thanks,
Michelle

s.19(1)

Issue:  CBC Victoria 

Parksville Qualicum Beach News, [REDACTED] Looking for response on high levels of sea lice reported at Cermaq Canada farms in BC's Clayoquot area. See press release issued May 5 by Clayoquot Action Campaigns, provided below.

Deadline: Friday, May 5, 4:00 p.m. PST

Recommendation: email approved response

Approved by: Zac Waddington, Allison Webb, Claire Doucette

Media lines:

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath).
- Cermaq has applied for a permit but has not yet obtained one from the province of BC. Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.
- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.
- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

FOR IMMEDIATE RELEASE:

Salmon lice outbreak could devastate Clayoquot salmon



-30-

Clayoquot Action

s.19(1)

s.68(a)

High res photos of Clayoquot May 2018 juvenile salmon with lice and Cermaq salmon lice graphs available here:

<https://drive.google.com/drive/folders/1ps-GumjM4j7RmsYT-kVu1GjJR2oJltqz?usp=sharing>

Cermaq's public reporting webpage: <https://www.cermaq.com/wps/wcm/connect/cermaq-ca/cermaq-canada/our-promise/public-reporting/>

Jones, Simon

From: Jones, Simon
Sent: May-08-18 2:20 PM
To: Rainer, Michelle
Subject: RE: Media inquiry on sea lice

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Michelle,

[REDACTED] called to discuss sea lice biology – especially the effects of sea lice on juvenile salmon. She also asked about why we have sea lice thresholds in place on farms and my thoughts about Paramove.

Cheers,
Simon

From: Rainer, Michelle
Sent: May-08-18 1:44 PM
To: Jones, Simon
Subject: Media inquiry on sea lice

Hi Simon,
Further to the email I cc'd you on just now, the reporter wrote the story linked to below. Hope you don't mind that I sent her your way; I appreciate you might not be available at short notice. I have given her all possible info with regards to Cermaq exceedances and explained that your area is science. If you do end up connecting, please let me know.
Thanks,
Michelle

From: Rainer, Michelle
Sent: May-08-18 11:00 AM
To: [REDACTED]
Cc: RHQ - Media.PAC
Subject: DFO Pacific Region contact

s.19(1)

Hi [REDACTED]

I note that you did not receive a response for this story in time for deadline and just want to make sure you have our correct contact info for next time, as we didn't receive a request from you. For fastest response, please email Media.PAC@dfo-mpo.gc.ca. We appreciate receiving requests as early as possible in the day so that we have enough time to meet deadlines.

<https://www.thestar.com/vancouver/2018/05/04/dead-fish-swimming-lice-from-fish-farms-infecting-wild-baby-salmon-in-bc.html>

I have provided info below related to your story. Would it be possible to update?

DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.

Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.

Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.

Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.

DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.

DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

Kind regards,

Michelle Rainer

Communications Advisor | Conseillère en communications

Fisheries and Oceans Canada | Pêches et Océans Canada

200 - 401 Burrard Street, Vancouver, B.C. V6C 3S4 | 200 - 401 rue Burrard, Vancouver, C.-B. V6C 3S4

Telephone | Téléphone 604-775-5065

Delaney, Paula

From: Paylor, Adrienne
Sent: May-09-18 2:25 PM
To: Webb, Allison; Doucette, Claire
Subject: FW: Clayoquot Lice Management
Attachments: Draft Letter to Cermaq re-Lice in Clayoquot.docx

Allison and Claire,

Our fish health unit would like to request some additional information from Cermaq regarding sea lice levels in Clayoquot. This information will help inform us regarding adherence to licence conditions. Do you have any concerns with this approach or the wording in the attached?

Thank you,
Adrienne

From: Waddington, Zac
Sent: Wednesday, May 09, 2018 2:11 PM
To: Paylor, Adrienne; Keith, Ian; Manchester, Howie
Subject: Clayoquot Lice Management

We have been monitoring the management of lice in Clayoquot, and have been in discussion with fish health and veterinary staff at Cermaq regarding plans for lice management. These plans have changed throughout early 2018 as a result of ongoing delays with attaining a Pesticide Use Permit for Clayoquot. While we are sympathetic to this challenge, we have some questions to clarify what due diligence and mitigation options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

- Area-based SLICE treatment in late September to early October in Clayoquot had reduced efficacy and duration of effect than is expected at numerous sites. Please demonstrate how appropriate therapeutic SLICE use was ensured as per Merck's Slice Sustainability Project
- How were other treatment measures considered such as fresh water baths, increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, earlier start to harvest at most affected farms?

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

DFO veterinarians have been monitoring the management of lice in Clayoquot, and have been in discussions with fish health and veterinary staff at Cermaq regarding plans for lice management. These plans have changed throughout early 2018 as a result of ongoing delays with attaining a Pesticide Use Permit for peroxide use in Clayoquot. While we are sympathetic to this challenge, we have some questions to clarify what due diligence and mitigation options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

- Area-based SLICE treatment in late September to early October in Clayoquot had reduced efficacy and duration of effect than what is expected at numerous sites. Please demonstrate how appropriate therapeutic SLICE use was ensured as per Merck's Slice Sustainability Project.
- How were other treatment measures considered such as fresh water baths, increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, an earlier start to harvest at affected farms, and any other options considered?
- Was the assumption that Cermaq would have a PUP for peroxide use before the outmigration period reasonable? If so, please provide evidence to support this.
- What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?
- Based on our lice data, it appears that farms XXXXX have not had a reduction in "absolute sea lice inventory" as per licence condition 6.4(a).

[details and
confirmation pending Krista's analysis]

s.21(1)(a)

s.21(1)(b)

From: Keith, Ian
To: Paylor, Adrienne; Waddington, Zac; Sandberg, Krista; Manchester, Howie
Subject: RE: sea lice lines
Date: May-09-18 6:35:51 PM
Attachments: DFO is aware of the sea lice exceedances at Cernaq Canada lk2.docx

I didn't send you the right copy – I'm sorry.

Please see the version which reads better and includes Jon's suggestion that PMRA registration and the need for permitting is included.

Ian

From: Paylor, Adrienne
Sent: May-09-18 4:09 PM
To: Waddington, Zac; Keith, Ian; Sandberg, Krista; Manchester, Howie
Subject: RE: sea lice lines

Great I gave them to Michelle Rainer and she has updated.

Thx A

From: Waddington, Zac
Sent: Wednesday, May 09, 2018 3:54 PM
To: Keith, Ian; Sandberg, Krista; Manchester, Howie; Paylor, Adrienne
Subject: RE: sea lice lines

I agree with Ian's edits wholeheartedly. I should have picked up on that during my read, since Integrated Pest Management is about rotating tools before you see resistance, not merely in response to resistance.

Zac

From: Keith, Ian
Sent: May-09-18 3:31 PM
To: Waddington, Zac; Sandberg, Krista; Manchester, Howie
Cc: Paylor, Adrienne
Subject: FW: sea lice lines

This is how I would write the paragraph I have problems with, and think that our first conversations in November is the correct date to use.

From: Keith, Ian
Sent: May-09-18 3:00 PM
To: Paylor, Adrienne
Subject: RE: sea lice lines

s.19(1)

Hi Adrienne,

I just called Jon Chamberlain to confirm that it is Ministry of Environment, and attached please find my straight talk i.e. good practice rather than saying Integrated Pest Management.

From: Paylor, Adrienne
Sent: May-09-18 2:17 PM

To: Waddington, Zac; Keith, Ian; Manchester, Howie; Sandberg, Krista
Subject: FW: sea lice lines

Communications just sent me the final and approved media lines for Clayoquot. In speaking with C&P what we are doing right now is gathering information to "assess" if a violation has occurred.

I think our letter is idea is fine but I want to get C&P (Greg Plummer) to review it in the morning before we send it out. See new language below that removed the word "investigation" for future use.

Thanks,
Adrienne

From: Rainer, Michelle
Sent: Wednesday, May 09, 2018 1:48 PM
To: Paylor, Adrienne
Subject: sea lice lines

DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.

Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.

Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.

Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.

DFO is looking into the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.

DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

s.21(1)(a)

s.21(1)(b)

DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since November 2017~~January 2018~~ about measures to reduce sea lice levels.

Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. Companies in BC must submit and follow a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.

Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. As part of good practice, companies will ~~in cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath)~~ The product is registered for sea lice management in aquaculture by the pest management arm of Health Canada, and companies must apply for a permit use the product on a farm. Please contact Cermaq or the Province of BC's Ministry of Environment~~Agriculture~~ for further information on this process.

Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.

DFO is looking into the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.

DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at

DFO veterinarians have been monitoring the management of lice in Clayoquot, and have been in discussions with fish health and veterinary staff at Cermaq regarding plans for lice management. These plans have changed throughout early 2018 as a result of ongoing delays with attaining a Pesticide Use Permit for peroxide use in Clayoquot. While we are sympathetic to appreciate this challenge, we have some questions to clarify what due diligence and mitigation options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

- Area-based SLICE treatment in late September to early October in Clayoquot had reduced efficacy and duration of effect than what is expected at numerous sites. Please demonstrate how appropriate therapeutic SLICE use was ensured as per Merck's Slice Sustainability Project.
- How were other treatment measures considered such as fresh water baths, increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, an earlier start to harvest at affected farms, and any other options considered?
- Was the assumption that Cermaq would have a PUP for peroxide use before the outmigration period reasonable? If so, please provide evidence to support this.
- What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?
- Based on our lice data, it appears that farms XXXXX have not had a reduction in "absolute sea lice inventory" as per licence condition 6.4(a).

[details and
confirmation pending Krista's analysis]

s.21(1)(a)

s.21(1)(b)

From: Paylor, Adrienne
To: Waddington, Zac
Subject: RE: Clayoquot Lice Management
Date: May-10-18 12:55:50 PM

Ok I just spoke to Allison....I will call shortly

DFO veterinarians have been monitoring the management of lice in Clayoquot, and have been in discussions with fish health and veterinary staff at Cermaq regarding plans for lice management. These plans have changed throughout early 2018 as a result of ongoing delays with attaining a Pesticide Use Permit for peroxide use in Clayoquot. While we appreciate this challenge, we have some questions to clarify what options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

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- How were other treatment measures considered such as increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, an earlier start to harvest at affected farms, and any other options considered?
- What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?
- Based on our lice data currently available to us up to the end of March, it appears that Bawden, Dixon Bay, Millar Channel, Ross Pass and Saranac Island did not have a reduction in "absolute sea lice inventory" as per licence condition 6.4(a).

Please provide any information and/or documents to address the questions or that will assist in our assessment of compliance regarding this issue. I look forward to hearing from you by May 18, 2018. If you have any questions or require further clarification please do not hesitate to contact me at....

From: Waddington, Zac
Sent: Thursday, May 10, 2018 10:51 AM
To: Paylor, Adrienne; Keith, Ian; Manchester, Howie; Sandberg, Krista; Keith, Ian
Subject: RE: Clayoquot Lice Management

I will give you a shout right away. Please see the attached draft which highlights the farms that were over threshold in March, and had an upward trend in sea lice numbers during March. When sea lice numbers are submitted next week, we will be able to update these graphs further to include April. Thanks Krista!

Zac

From: Paylor, Adrienne
Sent: May-10-18 8:42 AM
To: Waddington, Zac; Keith, Ian; Manchester, Howie
Subject: RE: Clayoquot Lice Management

Hi Zac,

I have reviewed that letter with C&P and only had the attached changes. I know you guys were still working on it so when you have it all together we should provide an updated copy to Allison. She want me to call her for some more background but we haven't connected yet. I'm in meetings as of 9am so maybe you could arrange a short chat with her before the letter goes out.

Thx Adrienne

From: Waddington, Zac

Sent: Wednesday, May 09, 2018 2:11 PM

To: Paylor, Adrienne; Keith, Ian; Manchester, Howie

Subject: Clayoquot Lice Management

We have been monitoring the management of lice in Clayoquot, and have been in discussion with fish health and veterinary staff at Cermaq regarding plans for lice management. These plans have changed throughout early 2018 as a result of ongoing delays with attaining a Pesticide Use Permit for Clayoquot. While we are sympathetic to this challenge, we have some questions to clarify what due diligence and mitigation options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

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- How were other treatment measures considered such as fresh water baths, increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, earlier start to harvest at most affected farms?

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)

Lead Veterinarian - Pacific Region

Fisheries and Oceans Canada | Pêches et Océans Canada

Aquaculture Environmental Operations - Fish Health

Courtenay, British Columbia

Telephone | Téléphone: 250-703-0902

Fax | Télécopieur: 250-703-0921

Zac.Waddington@dfo-mpo.gc.ca

See attached motile lice levels by site, sea lice load by site, and total lice load combined for the 3 farms in question. May is estimated based on harvest plan and continued lice level increases of 2.5 motile lice / fish per week for those fish remaining despite recent decrease in lice level at Dixon due to salinity (ie the estimate is conservative).

Please demonstrate how appropriate therapeutic SLICE use was ensured as per Merck's Slice Sustainability Project.

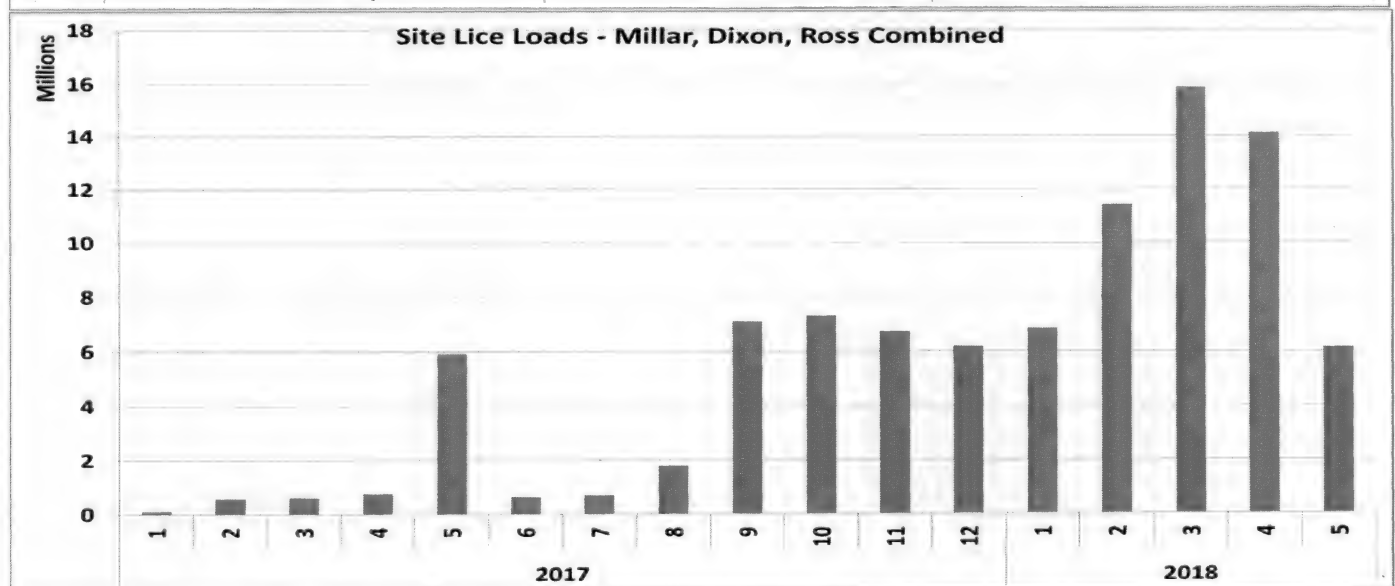
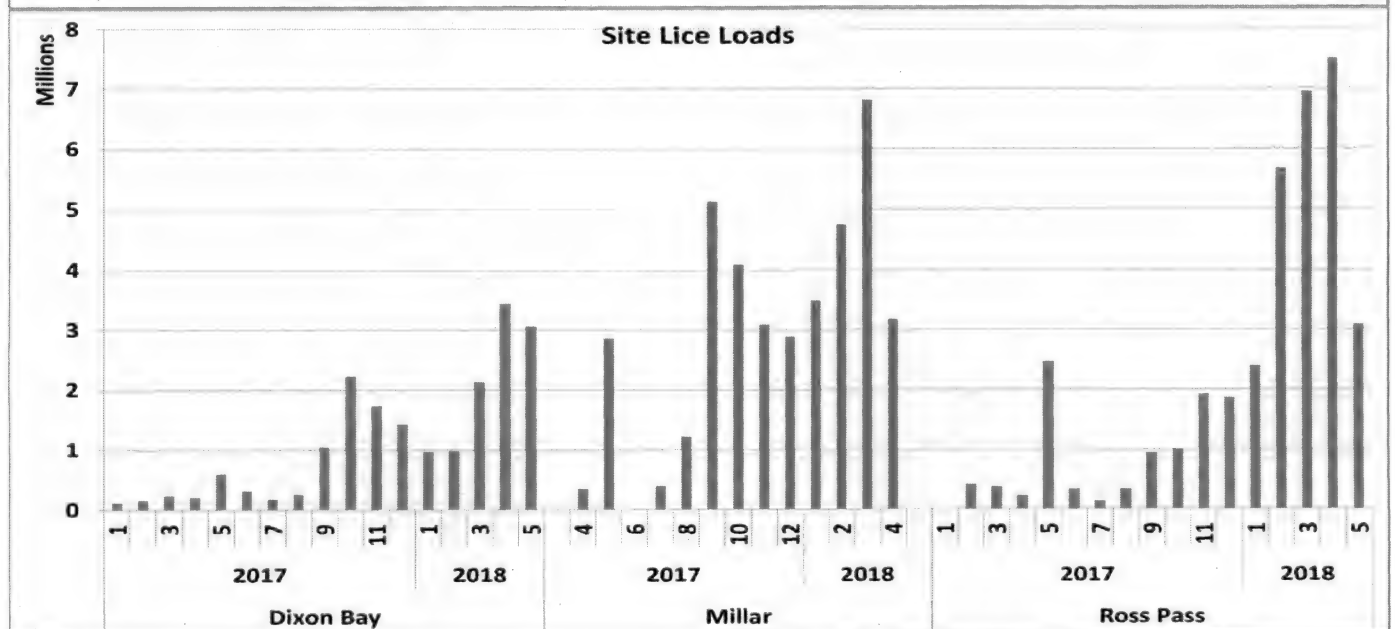
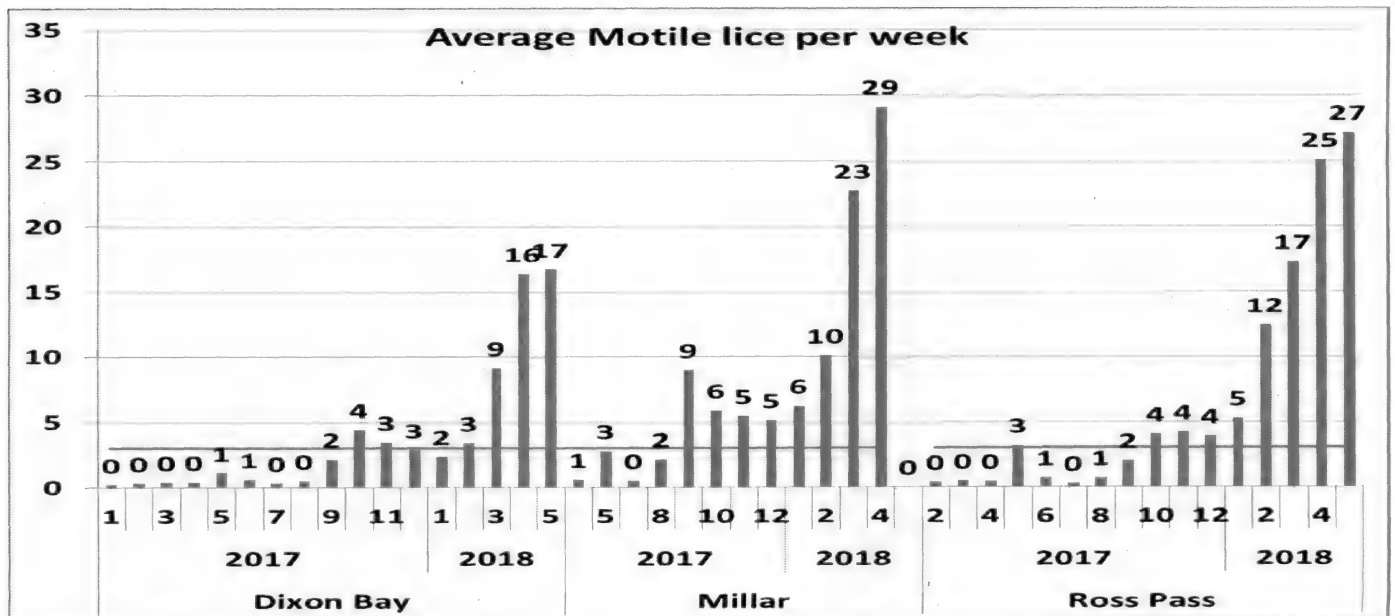
- 1) See attached. Of the 6 most recent treatments 5 would be considered very good with only one (Millar June) suboptimal. More recent treatments (October) have been slightly altered with regards to targeted dosage to compensate for the EB incorporation historical rates in feed at the farm.

How were other treatment measures considered such as increased processing capacity at other facilities, use of Marine Harvest Canada's Hdyrolicer, an earlier start to harvest at affected farms, and any other options considered?

- 2) Harvesting started at Dixon January 14th. Scheduled harvesting was originally planned for February 20th. Prior to the 14th the processing plant in Tofino was undergoing plant upgrades including effluent treatment improvements. Alternative harvesting / processing was considered but not chosen for several reasons. Harvesting and sending vessels around the island at that time of year is generally not recommended due to safety concerns and expected weather delays. Harvesting and moving fish across the island was not recommended due to lack of staff and logistics (totes or tankers and pumping stations) to develop that capacity in a safe manner given staffing was a limiting factor to manage anticipated facility upgrades and maximum plant capacity as is. If staffing and logistics could have been worked out Brown's Bay was also anticipating being at full capacity as of February and was not a long term viable option. As it turns out Brown's Bay has been at full capacity since mid-February.
- 3) As of February Marine Harvest Canada's Hydrolicer was not available for use. Note that this hydrolicer has not been used as of May 2018 due to design flaws that impact the welfare of the treated fish in jeopardy. The hydrolicer currently being built for Cermaq Canada has been designed as purpose built with updated modifications to ensure optimal efficiency and improved welfare.
- 4) Salinity has a significant impact on lice levels (see graph for recent history). During the fall of 2017 freshwater was also trialed and considered. In situ freshwater was trialed at Fortune Channel. Although technically feasible to reduce salinity using desalination it was not practical due to technical limitations on scaling up the project to a full site (desalination equipment for just one cage was expensive, difficult to run, difficult to keep running full time due to fuel, and routinely down due to constant exchange of filters).

What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?

- 5) Cermaq has historically been involved in several wild smolt monitoring projects in Clayoquot but in 2016 implemented a standardized wild smolt monitoring program along with other industry partners to ensure independent data collection and reporting was occurring in a standardized way. Decisions regarding number of sites, sampling method, and timing corresponds to previous DFO investigations including those in the Broughton and Nootka Sound. This most recent program involves three sampling events in April and May involving 17 sites. See attachments for 2016 and 2017 summaries. Results are made public on the Cermaq website with a target of being made public within 8 weeks of data collection. These results have also been included in the MERP / BCSFA initiative involving Dr. Crawford Revie.
- 6) An additional sampling period (late May) has been added to the 2018 sampling period given the current circumstances. Despite the additional sampling we intend to have results made public within the original time period (before the end of June).
- 7) The dominant wild smolt species by far is the chum salmon. As with other areas we'll expect large annual variations dependent upon factors such as migration routes and timing, salinity, and wild returns. We plan on involving an external expert to review the Clayoquot data (Dr. Revie) much the same as has been done with the Broughton and Nootka data.



Flesh - Poor = < 80% of target average plus more than 3 < 50% of target; Acceptable = > 80 % average above target plus no more than 1 < 50% of target; Good = > 80 average above target plus all fish > 80 % of target

Feed - Poor = < 80%; Acceptable - 80 - 90%; Good > 90%

Site	Month	sample		Feed		Flesh	
				Average of EB	Average of Target	Average of EB	Average of Target
Dixon	6	1		4.9	5.0	67.6	60.0
		2				55.5	60.0
		3				79.6	60.0
		4				65.2	60.0
		5				58.7	60.0
	10	1		7.8	9.1	69.5	60.0
		2				63.4	60.0
		3				50.9	60.0
		4				34.5	60.0
		5				61.5	60.0
Ross	6	1		4.6	5.0	45.0	60.0
		2				67.0	60.0
		3				47.9	60.0
		4				56.1	60.0
		5				58.3	60.0
	10	1		7.3	7.7	85.7	60.0
		2				92.3	60.0
		3				54.4	60.0
		4				82.4	60.0
		5				75.2	60.0
Millar	6	1				39.0	60.0
		2				53.2	60.0
		3				24.1	60.0
		4				35.6	60.0
		5				53.7	60.0
	10	1		5.0	6.3	69.5	60.0
		2				63.4	60.0
		3				58.6	60.0
		4				48.3	60.0
		5				69.3	60.0

s.19(1)

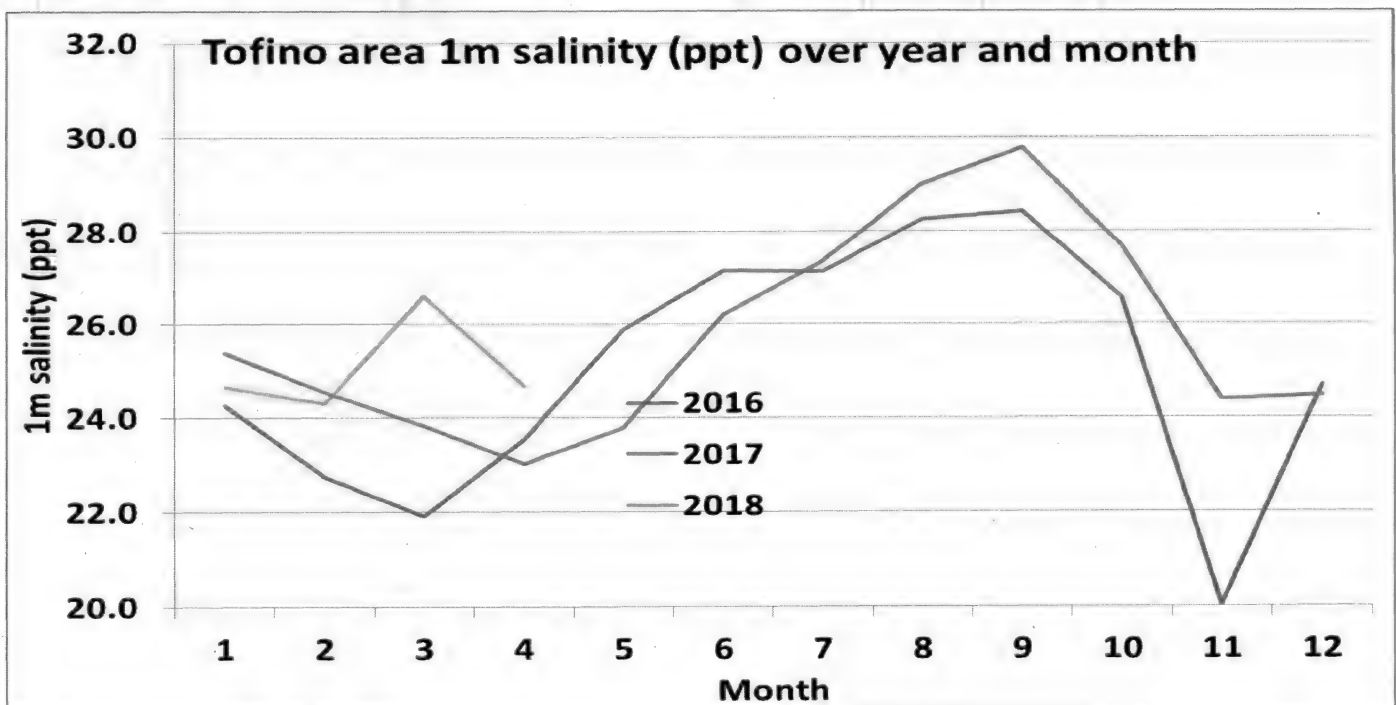


Table 5: Calculated sea lice prevalence and abundance by site as determined for chum salmon collected in Clayoquot Sound, BC in 2016.

Site	# of Chum Analyzed	# of Infected Chum	# of Lice	Sea Lice Prevalence	Sea Lice Abundance
SL1	90	57	120	63.3%	1.33
SL2	61	27	80	44.3%	1.31
SL3	32	0	0	0	0
MC1	63	12	13	19.0%	0.21
MC3	20	5	9	25.0%	0.45
HI1	42	4	5	9.5%	0.12
HI2	15	0	0	0	0
BS1	56	44	110	78.6%	1.96
BS2	90	50	125	55.6%	1.39
BS3	15	3	10	20.0%	0.67
BS4	79	39	94	49.4%	1.19
BS5	90	6	10	6.7%	0.11
BS6	64	33	97	51.6%	1.52
FC2	0	0	0	-	-
FC3	35	15	19	42.9%	0.54
FC4	61	5	5	8.2%	0.08
FC5	23	14	29	60.9%	1.26
TOTAL	836	314	726	37.6%	0.87

Table 4: Results of analysis for sea lice infestation on the sample population collected by beach seine in Clayoquot Sound, BC in 2017.

Species	Sample size (n)	Total number of lice observed	Total number of fish infested	Prevalence (%)	Abundance	Average Intensity
chum	1122	354	222	19.8	0.32	1.6
coho	84	21	8	9.5	0.25	2.6
sockeye	38	6	4	10.5	0.16	1.5
threespine stickleback	1	0	0	0	0	0
Total	1245	381	234	18.8	0.31	1.6

From: Rainer, Michelle
To: Waddington, Zac
Subject: RE: Clayoquot lice management
Date: May-14-18 11:57:48 AM

Thanks, Zac. Should also have asked, can we add that we will do additional monitoring of wild fish in the area? For a past issue we used this line:

- In addition to the monitoring undertaken by industry, the Department is conducting supplementary monitoring of juvenile wild salmon in the vicinity of these farms.

From: Waddington, Zac
Sent: May-14-18 11:39 AM
To: Rainer, Michelle
Subject: FW: Clayoquot lice management

*****Confidential Not For Distribution*****

Please see below for our letter sent Friday.

Zac

From: [REDACTED]
Sent: May-13-18 2:47 AM
To: Keith, Ian
Cc: Waddington, Zac
Subject: Re: Clayoquot lice management

Thanks Ian. I will make sure everyone is informed and start on a response no day. [REDACTED]

[REDACTED]

[REDACTED]

CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext [REDACTED]
Mobile + [REDACTED]

s.19(1)

Cermaq Canada Ltd.
203 - 919 Island Hwy
V9W 2C2 Campbell River, BC, Canada

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On May 11, 2018, at 4:02 PM, Keith, Ian <Ian.Keith@dfo-mpo.gc.ca> wrote:

Hi [REDACTED]

DFO veterinarians have been monitoring the management of lice in Clayoquot, and have been in discussions with fish health and veterinary staff at Cermaq regarding plans for lice management since Fall 2017. These plans changed throughout early 2018, from 1) a January 11 plan to SLICE treat one farm pending favourable bioassay, and immediate harvest in anticipation of the outmigration period for those 3 farms where SLICE treatment was contraindicated ; to 2) a April 30 plan to peroxide-treat farms where there was exceedance during the outmigration period where SLICE treatment is contraindicated, and manage by harvest at the others. Note that the DFO response January 12 to the January 11 plan stated that when using harvest as a management tool in advance of the outmigration period, that harvesting would have to be finished by the end of February.

Millar is the only farm that has been harvested-out, to date, and none of Ross, Dixon, Mussel and Saranac, where the lice management plan is harvest, have met the required outcome of reduction in "absolute sea lice inventory" (as per licence condition 6.4(a)), based on lice data currently available to us (using average month inventory x average abundance).

While we appreciate the challenges, including delays in acquiring a Pesticide Use Permit for peroxide, we require further explanation and evidence that indicate to DFO what options have been pursued and exhausted by Cermaq that justify the current state of lice burden on numerous farms in Clayoquot. Specifically:

- Area-based SLICE treatment in late September to early October at numerous sites in Clayoquot had reduced efficacy and duration of effect than what is expected. Please demonstrate how appropriate therapeutic SLICE use was ensured as per Merck's Slice Sustainability Project.
- How were other treatment measures considered such as increased processing capacity at other facilities, use of Marine Harvest Canada's Hydrolicer, an earlier start to harvest at affected farms, and any other options considered?
- What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?

Please provide any information and/or documents to address the questions or that will assist in our assessment of compliance regarding this issue. I look forward to hearing from you by May 18, 2018. If you have any questions or required further clarification please do not hesitate to contact Zac Waddington at 250-703-0902 or Ian Keith at 250-703-0917.

Thanks for your attention concerning this issue.

Regards,
Ian

s.19(1)

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations – Fish Health
#103 – 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

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s.16(2)(c)

From: Jensen, Neil
To: Waddington, Zac
Subject: RE: Your Voice Mail Today
Date: May-23-18 11:59:19 AM

I'm not sure as I just found out about it. Bernie said that it was expected to occur fairly soon. However, in gov't, "fairly soon" often means something different than what you and I would think... Adrienne would probably know.

Neil Jensen

Fisheries & Oceans Canada / Pêches et Océans Canada
Conservation & Protection / Conservation et Protection

From: Waddington, Zac
Sent: May-23-18 11:57 AM
To: Jensen, Neil
Subject: RE: Your Voice Mail Today

Yes I did briefly chat with him about that. What's the time frame for that marine mammal section to be amended?

Zac

From: Jensen, Neil
Sent: May-23-18 11:56 AM
To: Waddington, Zac
Subject: RE: Your Voice Mail Today

Good luck! As for getting the COL changed, try speaking to Bernie as he thought there may be opportunity to change it at the same time as the marine mammal section.

Neil Jensen

Fisheries & Oceans Canada / Pêches et Océans Canada
Conservation & Protection / Conservation et Protection

From: Waddington, Zac
Sent: May-23-18 11:54 AM
To: Jensen, Neil
Cc: Doucette, Claire
Subject: RE: Your Voice Mail Today

Thanks very much for your response, I did have a chance to chat with Claire and she explained where C and P was at with regards to this case and numerous other shellfish cases. For now I have what I need to respond to Cermaq and will leave the ball with C and P regarding whether a case can/will be made regarding this sea lice issue in Clayoquot.

Zac

From: Jensen, Neil
Sent: May-23-18 11:25 AM
To: Waddington, Zac
Subject: Your Voice Mail Today

Hi Zac,

I'm sorry to have missed your call earlier. I suggest that you contact Claire or Joe Knight directly to discuss the letter and C&P response to your request to look at the sea lice issue. I give advice and work on policy issues, but Joe is the Detachment Supervisor that makes the decisions for operational activities, so I will defer to him (or Claire as Chief) to properly help you out. I gave them a heads up to call you today, but I'm not sure what they are up to today or their availability. I suggest that you calling either one if you don't hear from them by early afternoon.

Neil Jensen

Fishery Officer / Agent des pêches

Senior Compliance Officer / Conservation and Protection / Aquaculture
Fisheries and Oceans Canada / Government of Canada
Neil.Jensen@dfo-mpo.gc.ca / Tel : 250-754-0386
2 – 1965 Island Diesel Way, Nanaimo, BC V9S 5W8

Agent principal d'application de la réglementation / Conservation et Protection / Aquaculture
Pêches et Océans Canada / Gouvernement du Canada
Neil.Jensen@dfo-mpo.gc.ca / Tél: 250-754-0386
2 – 1965, chemin Island Diesel, Nanaimo, CB V9S 5W8

Paylor, Adrienne

From: Paylor, Adrienne
Sent: May-24-18 11:27 AM
To: Jensen, Neil; Walde, Kirsty
Subject: FW: Clayoquot lice management

Just as an FYI for your files it looks like our AMD vet's have received some of the requested information from Cermaq and will continue to assess the situation. I will keep you informed as things move forward.

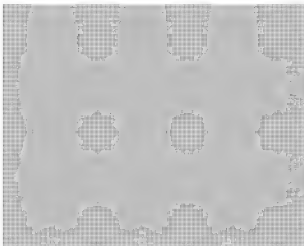
Thank you,
Adrienne

From: [REDACTED]
Sent: Wednesday, May 23, 2018 7:51 PM
To: Waddington, Zac
Cc: [REDACTED] Linda Sams; Keith, Ian; Paylor, Adrienne; Webb, Allison
Subject: Re: Clayoquot lice management

Hello Zac

We sincerely appreciate your prompt reply will ensure we work to send to you the requested information as quickly as possible

Kind Regards



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext [REDACTED]
Mobile + [REDACTED]

Cermaq Canada Ltd.
203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

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On May 23, 2018, at 4:21 PM, Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

Thank you very much for your response and detailed information regarding sea lice management in Clayoquot. We have reviewed the data provided and your responses have demonstrated that Cermaq did indeed make due efforts to prevent this current state of lice in

Clayoquot, and have taken efforts to monitor sea lice on wild fish. Cermaq's wild smolt monitoring program is comprehensive, timely and laudable.

According to our data Saranac was over threshold in March and April, and no data have been provided for that farm. Please provide similar data (if available) to what was provided for Dixon, Ross and Millar. We would also request any data regarding pre- and post-treatment bioassays conducted on farms treated in September and October 2017. We are hoping to complement our dataset of sea lice resistance demonstrated in other areas with these most recent cases. Finally, could you please provide us with the most current treatment locations and dates for Paramove in Clayoquot.

Cermaq has been forthcoming with our requests for further information and this is appreciated. We are grateful for your clarification regarding other treatment and processing options considered. We recognize the challenges faced by Cermaq with regards to lice management in Clayoquot in the recent past, and this current situation highlights the short comings in our own conditions of licence and lack of resiliency in harvest as a management tool during the outmigration. We will be considering how we can improve our own licence conditions in the future to ensure similar situations are prevented.

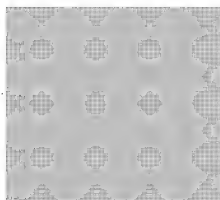
We have discussed this case with Conservation and Protection and have presented them with the relevant information and data. They are still in the process of determining how they wish to proceed. If you are able to provide us with the information requested above, then we in AEO Fish Health will be satisfied that we have a full picture of the steps taken by Cermaq to prevent and mitigate this current state of lice in Clayoquot.

Sincerely,

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

From: [REDACTED]
Sent: May-18-18 9:55 AM
To: Keith, Ian
Cc: Waddington, Zac; [REDACTED]
Subject: Re: Clayoquot lice management

Hi - see attached. I will be in the office this afternoon if you have questions.



s.19(1)



Phone +1 250-286-0022
Direct +1 250-286-0022 ext [REDACTED]
Mobile + [REDACTED]

Cermaq Canada Ltd.
203 - 919 Island Hwy
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From: [REDACTED]
To: "Keith, Ian" <Ian.Keith@dfo-mpo.gc.ca>
Cc: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Date: 13/05/2018 02:47 AM
Subject: Re: Clayoquot lice management

Thanks Ian. I will make sure everyone is informed and start on a response no day. [REDACTED]

On May 11, 2018, at 4:02 PM, Keith, Ian <Ian.Keith@dfo-mpo.gc.ca> wrote:

Hi [REDACTED]

DFO veterinarians have been monitoring the management of lice in Clayoquot, and have been in discussions with fish health and veterinary staff at Cermaq regarding plans for lice management since Fall 2017. These plans changed throughout early 2018, from 1) a January 11 plan to SLICE treat one farm pending favourable bioassay, and immediate harvest in anticipation of the outmigration period for those 3 farms where SLICE treatment was contraindicated ; to 2) a April 30 plan to peroxide-treat farms where there was exceedance during the outmigration period where SLICE treatment is contraindicated, and manage by harvest at the others. Note that the DFO response January 12 to the January 11 plan stated that when using harvest as a management tool in advance of the outmigration period, that harvesting would have to be finished by the end of February.

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s.19(1)

- What, if any, monitoring of smolt lice burden has Cermaq conducted to monitor for effects on wild salmon smolts?

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Thanks for your attention concerning this issue.

Regards,
Ian

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
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s.16(2)(c)

Manchester, Howie


From: Waddington, Zac
Sent: May-25-18 5:01 PM
To: Charbonneau, Michelle
Cc: Manchester, Howie; Keith, Ian
Subject: Re: Plan for Zone 2.3 Audits next week

Yes we are still waiting to hear back from Cermaq regarding their own bioassays. But if there's nothing by Tuesday then we will be planning to collect our own samples on Thursday. I understand that'll work with your field plans?? As for the site, I haven't figured out which would be best, but for sample collection feasibility it'll have to be one with high burden. I'll let you know once/if the sampling is confirmed.

Zac

From: Charbonneau, Michelle
Sent: Friday, May 25, 2018 2:33 PM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: FW: Plan for Zone 2.3 Audits next week

Hey Zac,


Our plan for Tofino sites is below. We may be reselecting for the SL audit at Fortune 
(mouthrot treatment in progress).


Judging from [Krista's SL graphs](#), I think you'll likely send us to Bawden, Ross or Dixon for the bio-assay (sites that showed increases post treatment), if we do that (Millar is harvested out, Ross and Dixon are expected to have less than three pens and be actively harvesting).

The possible replacements for Fortune's SL are Bawden or Bedwell. We can let the FHAS randomly select, or force it based on your input.

We would be deciding this by Tuesday afternoon at the latest.

Cheers,
MC

From: Charbonneau, Michelle
Sent: May-25-18 11:31 AM
To: 
Cc: Manchester, Howie; Stenhouse, Shawn
Subject: Plan for Zone 2.3 Audits next week



s.19(1)

s.20(1)(b)

Thanks for taking the time to clear that up. I've tried to outline the plan if we went ahead with SL at Fortune and the back-up plan if that isn't possible. Ideally Fortune will let us know their comfort with the SL audit by Tuesday afternoon.

I understand that Mussel Rock will be finishing up harvest Sunday/Monday, Millar is empty and both Ross and Dixon are [REDACTED]. That leaves Bedwell or Bawden as possible replacements for the SL audit at Fortune. If we know by Tuesday we can perform the reselection that evening and update both Bawden and Bedwell late on Tuesday so they know if they are to be ready or not.

I also understand Bare Bluff is undergoing net changes Monday and Tuesday and can accommodate their audit on Wednesday. We trust that Bare bluff will have reliable mortality collection at the time of the audit (i.e. divers if uplifts are not in the water due to net changes).

As discussed, let's keep the SL audit scheduled at Fortune for now and re-evaluate that on Tuesday. [REDACTED] we will reselect and both Bedwell and Bawden can be ready to sub in.

Here is the proposed area schedule. Please let us know asap if you have concerns; I'll need to send out the audit reminders (and heads up for Bedwell/Bawden) by 2:00pm today.

Site and Audit Type	Audit Day, ETA and Notes	Biosecurity / Site Order
Plover Point FH and SL Audits	Monday May 28 ETA 1115 Note: at this site DFO will have 2 staff and will plan to split up to tackle the FH and SL audits simultaneously upon arrival. Please be ready for that.	One site.
Saranac FH and SL Audits	Tuesday May 29 ETA 0800 (start SL)	Rant is first in biosecurity. Plan: drop one person at Saranac docking station in AM to start SL. Remaining DFO crew goes to Rant for SL and FH. When done at Rant, DFO crew can return to help out at Saranac.
Rant FH and SL Audits	Tuesday May 29 ETA 0815 Note: at this site DFO will have 2 staff and will plan to split up to tackle the FH and SL audits simultaneously upon arrival. Please be ready for that.	
Bare Bluff FH and SL Audits	Wednesday May 30 ETA 0830 Note: If we are doing SL at Fortune DFO will leave one staff at Bare Bluff in the AM to start SL. If we are not able to do SL at Fortune DFO will have 2 staff arrive at Bare Bluff and will plan to split up to tackle the FH and SL audits simultaneously upon arrival. Please be ready for that.	Fortune is first in biosecurity. *If fortune is comfortable conducting SL the plan is: drop one person at Bare Bluff docking station in AM to start SL. Remaining 2 DFO crew go to Fortune for SL and FH. When done at Fortune, DFO crew can return to help out at Bare Bluff.
Fortune FH and SL Audits*	Wednesday May 30 ETA 0845 * if SL	** [REDACTED] Fortune precludes SL sampling

s.20(1)(b)
s.21(1)(b)

	<p>ETA 0815 **if FH only</p> <p>Ideally, we will know Tuesday afternoon if staff at Fortune are comfortable handling fish for the SL audit.</p> <p>*If Fortune is comfortable doing the SL audit, DFO will have 2 staff and will plan to split up to tackle the FH and SL audits simultaneously upon arrival. Please be ready for that.</p> <p>**If Fortune is not comfortable doing the SL audit, DFO will drop one person here for the FH audit and either Bedwell or Bawden will be selected as the SL audit replacement. In this case the FH and SL audits at Bare Bluff would take place simultaneously.</p>	<p>the plan is: DFO drop one person at Fortune to conduct the FH audit, crew continues to Bare Bluff.</p> <p>Can our staff at Fortune get a ride with your FH to Bawden?</p>
<p>Bawden</p> <p>*Possible substitute for Fortune SL Nothing scheduled but please be ready for a SL Wednesday afternoon or Thursday morning.</p>	<p>Wednesday May 30 ETA 1400 (earlier if DFO gets a ride to Bawden with your FH from Fortune, later if DFO crew from Bare Bluff picks up DFO at Fortune and heads all together to Bawden). Or Thursday May 31 ETA 0815</p> <p>Ideally we would know Tuesday evening if Bawden needs to be ready on Wed/Thurs</p>	<p>If Bawden is selected as the replacement for Fortune's SL audit we will try to get there Wednesday, time permitting.</p> <p>I understand site order is Fortune<Bare Bluff<Bawden so our crew from Bare Bluff and from Fortune could feasibly go to Bawden after these audits for a SL audit.</p> <p>If we can't make it work Wednesday at Bawden, Thursday AM is the back-up.</p>
<p>Bedwell</p> <p>*Possible substitute for Fortune SL Nothing scheduled but please be ready for a SL Thursday morning.</p>	<p>Thursday May 31 ETA 0815</p> <p>Ideally we would know Tuesday evening if Bedwell needs to be ready on Thurs</p>	<p>If Bedwell is selected as the replacement for Fortune we can't go there after having been at Bare Bluff.</p> <p>So Bedwell would need to be ready Thursday AM for a SL audit.</p>

Regards,

Michelle Charbonneau MSc.

Aquatic Science Biologist / Biologiste en sciences aquatiques

Fisheries and Oceans Canada / Pêches et Océans Canada

Aquaculture Environmental Operations / Opérations environnementales de l'aquaculture

Fisheries Management / Gestion des pêches

#103 2435 Mansfield Drive, Courtenay, B.C

Michelle.Charbonneau@dfo-mpo.gc.ca

Telephone | Téléphone 250.895.1724

Facsimile | Télécopieur 250.703.0921

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No information has been removed or severed from this page

Sandberg, Krista

From: Sandberg, Krista
Sent: May-29-18 12:44 PM
To: Waddington, Zac; Manchester, Howie; Keith, Ian
Subject: RE: bioassay

Hey guys, I've updated all the graphs to include April data, including addition of harvest plans to the harvesting graph. Enjoy ☺

\\svbcvanfp01\aquas\AEO\Courtenay\FH\sea lice management\Sea Lice - Clayoquot graphs 2017.xls

Krista Sandberg

Office | Bureau 250-286-5835

Cellular | Cellulaire [REDACTED]



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From: Waddington, Zac
Sent: May-29-18 9:26 AM
To: Sandberg, Krista; Manchester, Howie; Keith, Ian
Subject: Re: bioassay

Thanks a bunch Krista. I know your super busy, but is there anyway you could generate the "absolute sea lice inventory" graph for sites using the April lice and inventory data as was done for March? It'll be important for C and P, I'm expecting to have a meeting with them later this week at some point.

Zac

From: Sandberg, Krista
Sent: Tuesday, May 29, 2018 11:16 AM
To: Manchester, Howie; Waddington, Zac; Keith, Ian
Subject: RE: bioassay

I updated the inventory files yesterday. Miller and Ross are empty, and it looks like they are currently harvesting from Mussel and Saranac with plans to empty Dixon in June.

Krista.

Krista Sandberg

Office | Bureau 250-286-5835

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From: Manchester, Howie
Sent: May-29-18 7:09 AM
To: Waddington, Zac; Keith, Ian
Cc: Sandberg, Krista
Subject: RE: bioassay

s.16(2)(c)

Thanks for this. I would ask that if we are to go ahead that one of you give [REDACTED] the heads up and let him know we will be contacting [REDACTED] to arrange for Thursday. As for the farms I believe Ross is now empty and Dixon is aggressively harvesting, not sure when harvest ends at Dixon and whether we can get lice while they are harvesting. So as far as who is left to get lice from I believe Bawden is the next candidate. We could look at Saranac and Rant but I don't know if they showed obvious failure in Krista's graphs.

I'm out in the field all day today but will look at data tonight, If you have time to pick a good candidate site that would be great, anyways keep me posted on whether it's a go or not.

Thanks

Howie

From: Waddington, Zac
Sent: May-29-18 4:34 AM
To: Keith, Ian
Cc: Manchester, Howie
Subject: RE: bioassay

[REDACTED]
[REDACTED] I am really curious for your opinion when/if [REDACTED] gets back to you with his bioassay results, and if you are satisfied with what he provides. I do not have a minimum testing standard in mind that would satisfy me, but my rationale was that if [REDACTED] provided good evidence of resistance then our own sampling wouldn't be necessary. My thoughts would be that if there's any doubt about whether [REDACTED] bioassay results show resistance, or is he doesn't get them to us in time, then we should just plan to collect our own samples. So at this point I would suggest that Howie and team plan to collect lice on Thursday from the most convenient site with a documented SLICE failure (as based on the graphs Krista generated). I'm not sure of the state of harvest at Ross and Dixon, but they both had quite high lice levels. Does that sound like a workable plan?

Zac

From: Keith, Ian
Sent: May-28-18 6:54 PM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: bioassay

Hey,

[REDACTED] (I'm assuming the meeting is in Quebec.)
I had a response [REDACTED] about missed fish health events but have had no email about bioassay results. Howie would like to know tomorrow if they are to go ahead on Thursday, so I can phone [REDACTED] tomorrow to ask about bioassays he will be sharing. Is there some minimum that would satisfy you, or is your wish to have our independently collected lice for our own data? I don't know how C&P advised you – [REDACTED]
[REDACTED]

Thanks

Ian

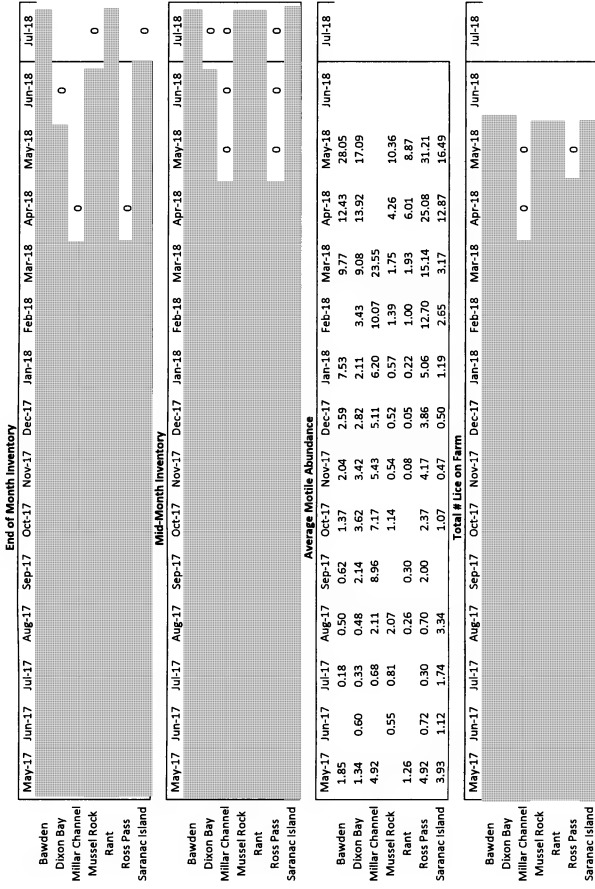
P.s: Howie was at Fortune today – [REDACTED] fish, March entry, and they are just exceeded threshold now. I'll ask [REDACTED] tomorrow what the plan is for these fish.

Pps: [REDACTED]

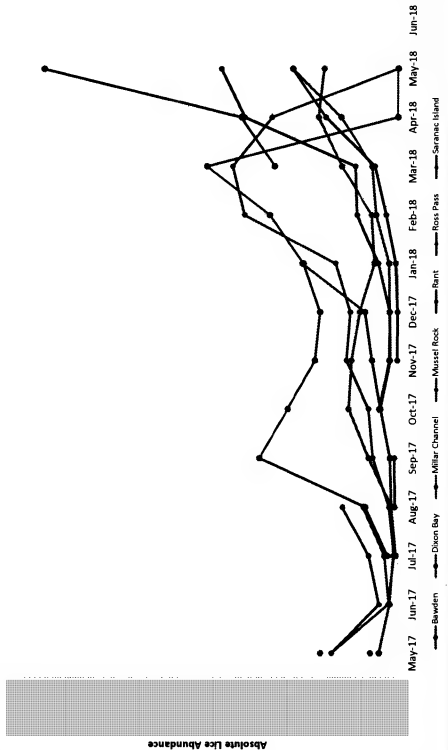
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s.20(1)(b)
s.21(1)(a)
s.21(1)(b)

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
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Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)



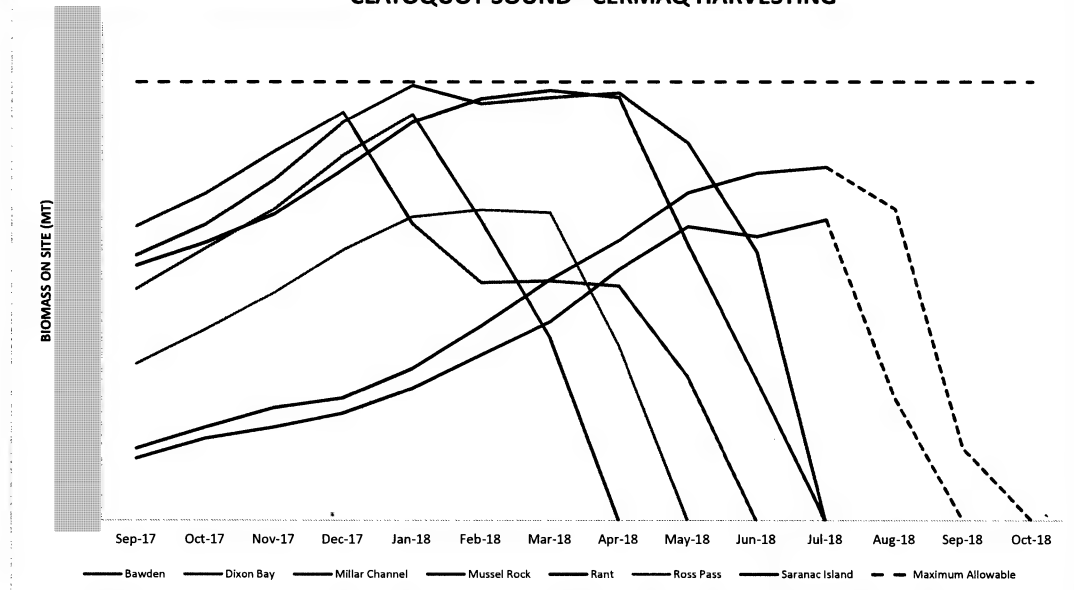
CLAYOQUOT SOUND - Total Motile Lice on Farm



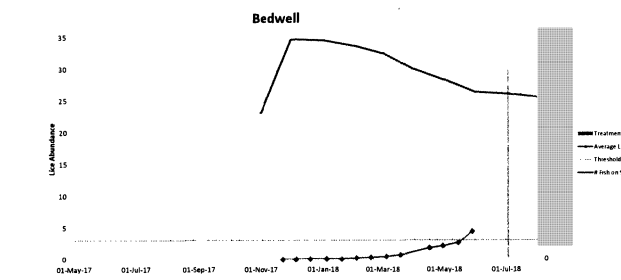
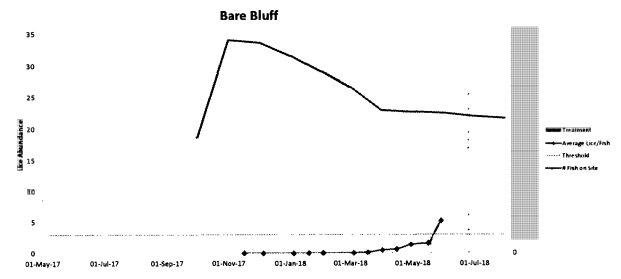
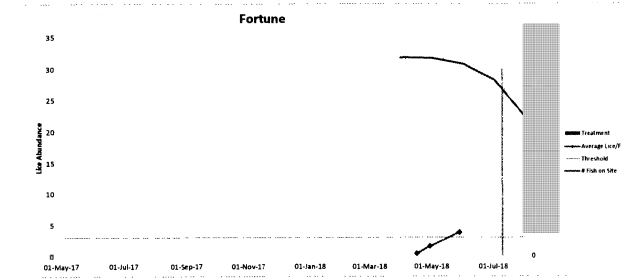
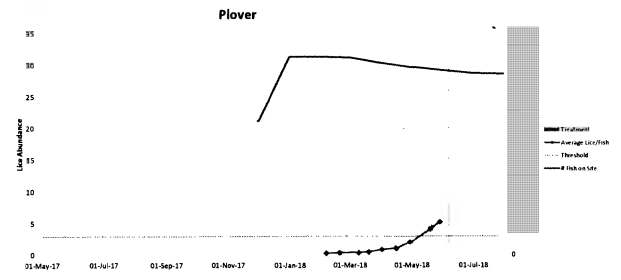
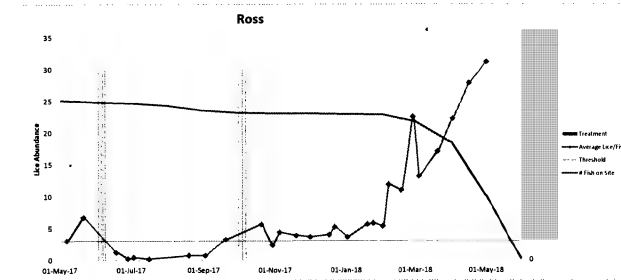
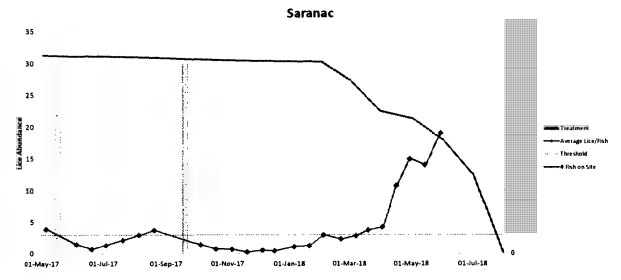
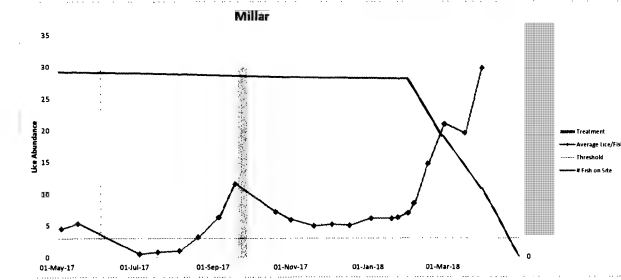
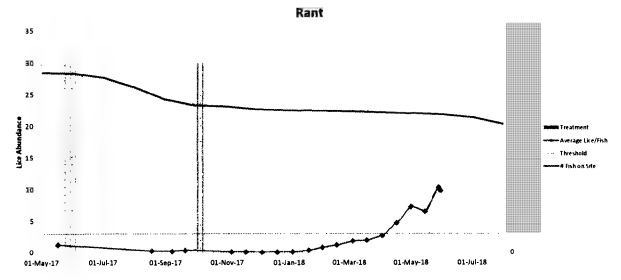
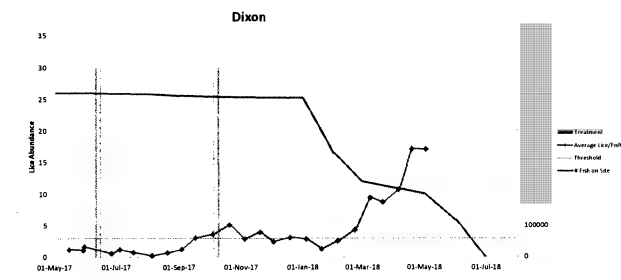
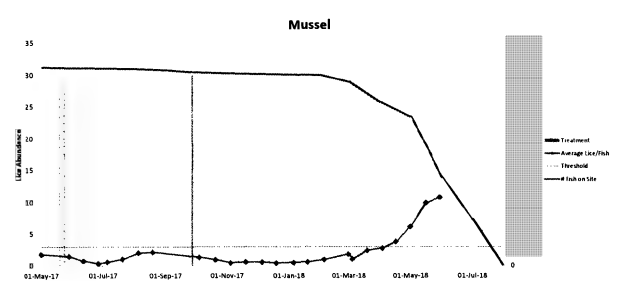
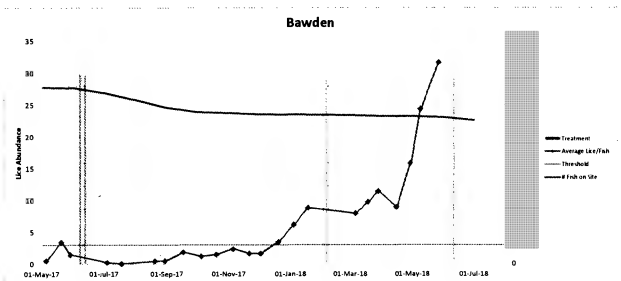
s.20(1)(b)

	Actual											Predicted		
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18
Bawden	374	493	562	646	796	996	1196	1511	1768	1708	1808			
Dixon Bay	1769	1968	2222	2456	1784	1434	1444	1413	868	0				
Millar Channel	1395	1638	1873	2198	2443	1802	1102	0						
Mussel Rock	1536	1673	1843	2111	2397	2537	2587	2545	1662	849	0			
Rant	434	562	678	739	915	1171	1451	1684	1972	2089	2126			
Ross Pass	945	1150	1373	1628	1824	1867	1849	1052	0					
Saranac Island	1598	1780	2050	2399	2619	2509	2546	2572	2270	1614	0			
Maximum Allowable	2640	2640	2640	2640	2640	2640	2640	2640	2640	2640	2640	2640	2640	2640
Bawden - predicted											1808	741	0	
Dixon Bay - predicted														
Millar Channel - predicted														
Mussel Rock - predicted														
Rant - predicted											2126	1873	436	0
Ross Pass - predicted														
Saranac Island - predicted														

CLAYOQUOT SOUND - CERMAQ HARVESTING



s.20(1)(b)



s.20(1)(b)

<i>Facility Name</i>	<i>Product</i>	<i>Treatment Start Date</i>	<i>Treatment End Date</i>
Bawden Point, Herbert Inlet	Slice	06-Jun-17	14-Jun-17
Dixon Point, Shelter Inlet	Slice	09-Jun-17	15-Jun-17
Dixon Point, Shelter Inlet	Slice	05-Oct-17	11-Oct-17
Fortune Channel, East side Warn Bay	Slice	12-Feb-17	18-Feb-17
Millar Channel, 2km S Hayden Passage	Slice	02-Jun-17	08-Jun-17
Millar Channel, 2km S Hayden Passage	Slice	21-Sep-17	27-Sep-17
Mussel Rock, Clayoquot Sound	Slice	19-May-17	25-May-17
Mussel Rock, Clayoquot Sound	Slice	24-Sep-17	30-Sep-17
Rant Point, Clayoquot Sound	Slice	24-May-17	03-Jun-17
Rant Point, Clayoquot Sound	Slice	29-Sep-17	05-Oct-17
Raza Island, Raza Passage	Slice	25-Jan-17	31-Jan-17
Raza Island, Raza Passage	Slice	16-Jan-17	22-Jan-17
Ross Pass, Northeast McKay Island	Slice	02-Jun-17	09-Jun-17
Ross Pass, Northeast McKay Island	Slice	01-Oct-17	07-Oct-17
Saranac Island, NW of Meares Island	Slice	13-May-17	19-May-17
Saranac Island, NW of Meares Island	Slice	16-Sep-17	23-Sep-17
West Side, Bedwell Sound	Slice	05-Feb-17	11-Feb-17
Plover	Paramove	07-Jun-18	
Bawden Point, Herbert Inlet	Paramove	11-Jun-18	
Bare Bluff	Paramove	24-Jun-18	
Fortune Channel, East side Warn Bay	Paramove	08-Jul-18	
Bedwell	Paramove	02-Jul-18	

Facility Reference Number	Licence Holder	Site Common Name	Latitude	Longitude	Fish Health Zone	Number of Counts Performed	monthly farm abundance male	monthly farm abundance females	monthly farm abundance Caligus	English Comments	French Comments	year class	entry date	age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3-2	2	0.03	0.01	0.02						single pen 17-Jan not included
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3-2	1	0.04	0.04	1.01	2.16					
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3-2	2	0.04	0.04	0.03	0.00					
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3-2	1	0.05	0.02	0.00	0.00					
1300	Marine Harvest Canada	Althorpe	50.47531	-125.80975	3-2	2	0.96	0.72	0.00	0.38					
1581	Marine Harvest Canada	Hardwicke	50.41339	-125.76974	3-2	0				Fallow	Mise en jachère				5 counts, 1st 3rd and 5th 2 pens; Initial sw entry 10-Jan, changed to yc2
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3-2	5	0.17	0.05	0.00	0.02	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.88981	3-2	0				Broodstock in spawning year	Géniteurs à l'année du frai				and only 2 pens on site

s.20(1)(b)

Facility Reference Number	Licence holder	Site Common Name	Latitude	Longitude	Fish Health Zone	Number of Counts Performed	monthly farm abundance of male	monthly farm abundance of females	monthly farm abundance of challenge	monthly farm abundance of Collaps	English Comments	French Comments	year class	entry date	age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.04	0.03	0.40	1.23						
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2	2	0.32	0.11	1.38	3.14	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				2nd count 4 pens
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.09	0.05	0.02	0.73						
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	1	0.07	0.05	0.00	0.00						
1300	Marine Harvest Canada	Althorpe	50.47531	-125.80975	3.2	0					Counts precluded by diminished stock (<4 pens)	Dénombrement non effectué en raison de la diminution des stocks (< 4 bassins)				Fallow as of 18-Feb
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	3	0.03	0.02	0.11	0.02	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				3 counts, 2nd 2 pens: Initial sw entry 10-Jan-17, changed to YC2
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.88981	3.2	1	0.15	0.05	0.08	0.00						single count of 3 pens - 1st pen 8 days before 2nd/3rd

s.20(1)(b)

Facility Reference Number	Dioxin Tolerant	Site Common Name	Latitude	Longitude	Fish Health Zone	Number of Counts Performed	monthly term abundance = mullus	monthly term abundance = fusus	monthly term abundance = chelonus	monthly term abundance = callinectes	English Comments	French Comments	year class	entry date	age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.14	0.05	0.00	4.00						2 pens counted Mar 29/30 moved to April; Management action planned; changed to yc2
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2	3	0.33	0.06	1.23	2.05						single pen 2-Apr moved to March
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.11	0.11	0.37	0.72						single pen 30-Mar moved to April; Management action planned
871	Gring Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	2	0.06	0.02	0.12	0.87						initial sw entry 13-Jan-17, changed to yc2
1300	Marine Harvest Canada	Althorpe	50.47531	-125.80975	3.2	0					Fallow	Mise en jachère				
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	4	0.06	0.04	0.69	0.31	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				4 counts, 1st and 3rd 2 pens; initial sw entry 10-Jan-17, changed to yc2
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.88981	3.2	1	0.12	0.02	0.32	0.45						

s.20(1)(b)

Facility Reference Number	Licence Holder	Site Common Name	Latitude	Longitude	Fish Health Zone	Number of Counts Performed	monthly farm abundance male	monthly farm abundance females	monthly farm abundance at station	monthly farm abundance	English Comments	French Comments	year class	entry date	age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.13	0.07	0.01	2.48						2 pens on March, 29/30 moved to April
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2	2	0.26	0.08	0.64	1.87						Single pen on 2-Apr moved to March
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.16	0.04	0.26	0.53						Single pen on 30-Mar moved to April
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	2	0.28	0.04	0.11	1.78						
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	4	0.70	0.19	1.45	0.25	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				4 counts, 1st and 3rd 2 pens
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.89381	3.2	3	0.26	0.09	1.11	0.96	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				3 counts, 2nd 2 pens

s.20(1)(b)

Facility Reference Number	License Holder	Site Commision Name	Latitude	Longitude	Risk Health Zone	Number of Counts Performed	monthly farm abundance - males	monthly farm abundance - females	monthly farm abundance - juveniles	English Comments	Fishnet Comments	year class	entry date	age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.07	0.03	0.00	0.07					
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2	2	0.12	0.04	0.14	0.18					
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.00	0.00	0.03	0.09					
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	2	0.16	0.07	0.05	1.29					
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	4	0.41	0.17	1.20	1.32	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences; les dépasse même				4 counts, 1st and 3rd 2 pens; 2nd 10 pens
78	Marine Harvest Canada	Phillips Arm	50.48825	-125.35658	3.2	0				Count(s) not required (<4 pens)	Dénombrement(s) non requis (< 4 bassins)				
1336	Marine Harvest Canada	Shaw Point	50.48527	-125.88981	3.2	4	0.44	0.14	1.55	1.27	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences; les dépasse même				4 counts, 1st and 3rd 2 pens
380	Marine Harvest Canada	Sonora Point	50.42362	-125.30517	3.2	2	0.19	0.00	0.49	0.20	Bath Treatment: Sampling methodology does not meet requirements outlined in licence conditions (<4 pens)	Traitement dans un bain: La méthodologie d'échantillonnage ne répond pas aux exigences mentionnées dans les conditions de permis (< 4 bassins)			2 counts of 2 pens; fish treated with H2O2 during transfer from Port E, beginning 8-May. Given that farm would not have been considered "active" for much of May, counting methodology is acceptable-ZW

s.20(1)(b)

Facility Reference Number	License Holder	Site Common Name	Latitude	Longitude	High Month Zone	Number of Counts Performed	Monthly Farm Abundance as Reported	Monthly Farm Abundance as Calculated	Monthly Farm Abundance as Calculated	English Comments	French Comments	Year class	Entry date	Age	Internal Comments
1401	Cernaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.07	0.02	0.00	1.36	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même				2nd count 4 pens
304	Cernaq Canada	Raza Island	50.32159	-125.00882	3.2	2	0.18	0.07	0.32	0.16					
306	Cernaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.00	0.00	0.00	0.06					
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	3	0.31	0.16	0.33	0.43					
100	Marine Harvest Canada	Lees Bay	50.41063	-125.70029	3.2	1	0.00	0.00	0.00	0.13	Bath Treatment: Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement; Count(s) not required (<4 pens)	Traitement dans un bain; La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même; Dénombrement(s) non requis (<4 bassins)			single count of 6 pens during transfer/post H202 18-Jun
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	4	0.74	0.35	1.53	1.60	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			4 counts, 1st and 4th 2 pens
78	Marine Harvest Canada	Phillips Arm	50.48825	-125.35658	3.2	3	0.03	0.00	0.35	0.06	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			3 counts, 2nd 2 pens
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.85981	3.2	4	0.59	0.32	2.38	1.17	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			4 counts, 3rd and 4th 2 pens
380	Marine Harvest Canada	Sonora Point	50.42582	-125.30517	3.2	3	0.17	0.03	2.24	0.77	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			3 counts, 2nd 2 pens

s.20(1)(b)

Facility Reference Number	License Holder	Site Country Name	Latitude	Longitude	ICR Health Zone	Number of Counts Performed	monthly firm abundance & median	monthly firm abundance & median	monthly firm abundance & median	English Comments	French Comments	year class	entry date	Age	Internal Comments
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.12	0.04	0.01	7.96					Note from industry that Aug counts show reduction in callus
304	Cermaq Canada	Reza Island	50.37159	-125.00882	3.2	2	0.11	0.09	0.09	0.12					
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.00	0.00	0.00	0.03					
871	Greg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	1	0.43	0.15	1.03	0.68					
790	Marine Harvest Canada	Chancellor Channel	50.41723	-125.66284	3.2	1	0.15	0.05	1.65	0.10	La méthodologie d'échantillonnage ne répond pas aux exigences mentionnées dans les conditions de permis (< 4 bassins)				2 pens - recent transfer from Larsen starting 4-Jul
100	Marine Harvest Canada	Lees Bay	50.41063	-125.70029	3.2	4	0.12	0.01	2.46	1.03	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même				4 counts, 1st 3rd 2 pens
211	Marine Harvest Canada	Oldollo	50.30946	-125.31618	3.2	4	1.38	0.59	5.58	3.85					
778	Marine Harvest Canada	Phillips Arm	50.48825	-125.35658	3.2	4	0.24	0.09	1.41	1.43					
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.88981	3.2	2	0.46	0.19	1.34	1.73	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même				single pen 1-Jul moved to June; 2 counts, 2nd 12 pens
380	Marine Harvest Canada	Sonora Point	50.43362	-125.30517	3.2	5	0.61	0.10	4.71	2.44	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même				5 counts, 5th 2 pens

S.20(1)(b)

From: Paylor, Adrienne
To: Doucette, Claire
Cc: Waddington, Zac
Subject: [REDACTED]
Date: May-29-18 4:55:33 PM
Attachments: [REDACTED]

Hi Claire,

[REDACTED]

Thx Adrienne

From: Waddington, Zac
Sent: Tuesday, May 29, 2018 11:55 AM
To: Paylor, Adrienne
Subject: [REDACTED]

[REDACTED]

Zac

From: Paylor, Adrienne
Sent: May-29-18 10:17 AM
To: Waddington, Zac
Subject: [REDACTED]

Hi Zac,

[REDACTED]

Thanks
Adrienne

From: Doucette, Claire
Sent: Tuesday, May 29, 2018 10:04 AM
To: Paylor, Adrienne
Subject: [REDACTED]

Adrienne,

[REDACTED]

s.21(1)(a)
s.21(1)(b)
s.23

Claire

From: Steele, Sharon <Sharon.Steele@ppsc-sppc.gc.ca>

Sent: Monday, May 28, 2018 4:16 PM

To: Doucette, Claire <Claire.Doucette@dfo-mpo.gc.ca>

Cc: Walde, Kirsty <Kirsty.Walde@dfo-mpo.gc.ca>; Knight, Joe <Joe.Knight@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Gray, Trevor <Trevor.Gray@dfo-mpo.gc.ca>; Lohrasb, Katie <Katie.Lohrasb@ppsc-sppc.gc.ca>; Torvik, Kendra <Kendra.Torvik@ppsc-sppc.gc.ca>

Subject: [REDACTED]

Hi Claire,

[REDACTED]

[REDACTED]

Sharon

Sharon Steele

Senior Counsel/Team Leader

Supreme Court and Regulatory Litigation

Public Prosecution Service of Canada

British Columbia Regional Office

900 - 840 Howe Street

Vancouver, BC V6Z 2S9

Phone: 604.666.8916

Fax: 604.666.1599

s.21(1)(a)

s.21(1)(b)

s.23

**Pages 106 to / à 107
are withheld pursuant to section
sont retenues en vertu de l'article**

23

**of the Access to Information Act
de la Loi sur l'accès à l'information**

From: Sandberg, Krista
To: Waddington, Zac; Manchester, Howie; Keith, Ian
Subject: RE: bioassay
Date: May-29-18 9:35:58 AM
Attachments: image001.png

Ok, I will do the April sea lice report today.

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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of Canada

Gouvernement
du Canada

Canada

From: Waddington, Zac
Sent: May-29-18 9:26 AM
To: Sandberg, Krista; Manchester, Howie; Keith, Ian
Subject: Re: bioassay

Thanks a bunch Krista. I know your super busy, but is there anyway you could generate the "absolute sea lice inventory" graph for sites using the April lice and inventory data as was done for March? It'll be important for C and P, I'm expecting to have a meeting with them later this week at some point.

Zac

From: Sandberg, Krista
Sent: Tuesday, May 29, 2018 11:16 AM
To: Manchester, Howie; Waddington, Zac; Keith, Ian
Subject: RE: bioassay

I updated the inventory files yesterday. Miller and Ross are empty, and it looks like they are currently harvesting from Mussel and Saranac with plans to empty Dixon in June.

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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of Canada

Gouvernement
du Canada

Canada

From: Manchester, Howie
Sent: May-29-18 7:09 AM
To: Waddington, Zac; Keith, Ian
Cc: Sandberg, Krista
Subject: RE: bioassay

s.16(2)(c)

Thanks for this. I would ask that if we are to go ahead that one of you give [REDACTED] the heads up and let him know we will be contacting [REDACTED] to arrange for Thursday. As for the farms I believe Ross is now empty and Dixon is aggressively harvesting, not sure when harvest ends at Dixon and whether we can get lice while they are harvesting. So as far as who is left to get lice from I believe Bawden is the next candidate. We could look at Saranac and Rant but I don't know if they showed obvious failure in Krista's graphs.

I'm out in the field all day today but will look at data tonight, If you have time to pick a good candidate site that would be great, anyways keep me posted on whether it's a go or not.

Thanks

Howie

From: Waddington, Zac
Sent: May-29-18 4:34 AM
To: Keith, Ian
Cc: Manchester, Howie
Subject: RE: bioassay

[REDACTED] I am really curious for your opinion when/if [REDACTED] gets back to you with his bioassay results, and if you are satisfied with what he provides. I do not have a minimum testing standard in mind that would satisfy me, but my rationale was that if [REDACTED] provided good evidence of resistance then our own sampling wouldn't be necessary. My thoughts would be that if there's any doubt about whether [REDACTED] bioassay results show resistance, or is he doesn't get them to us in time, then we should just plan to collect our own samples. So at this point I would suggest that Howie and team plan to collect lice on Thursday from the most convenient site with a documented SLICE failure (as based on the graphs Krista generated). I'm not sure of the state of harvest at Ross and Dixon, but they both had quite high lice levels. Does that sound like a workable plan?

Zac

s.19(1)

From: Keith, Ian
Sent: May-28-18 6:54 PM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: bioassay

Hey,

[REDACTED] (I'm assuming the meeting is in Quebec.)
I had a response [REDACTED] about missed fish health events but have had no email about bioassay results.

Howie would like to know tomorrow if they are to go ahead on Thursday, so I can phone [REDACTED] tomorrow to ask about bioassays he will be sharing. Is there some minimum that would satisfy you,

or is your wish to have our independently collected lice for our own data? I don't know how C&P advised you – [REDACTED]

Thanks

Ian

Ps: Howie was at Fortune today – [REDACTED] fish, March entry, and they are just exceeded threshold now.

I'll ask [REDACTED] tomorrow what the plan is for these fish.

Pps: [REDACTED]

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations – Fish Health
#103 – 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)

s.19(1)

s.20(1)(b)

s.21(1)(a)

s.21(1)(b)

Paylor, Adrienne

From: Webb, Allison
Sent: May-29-18 11:51 AM
To: Paylor, Adrienne
Subject: FW: Info re sea lice for Rebecca

Is this what you are looking for?

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Webb, Allison
Sent: 2018-May-04 6:20 PM
To: Thomson, Andrew
Subject: RE: Info re sea lice for Rebecca

Discussed it with Adrienne and she said we weren't able to move forward on the options proposed by Karen. I'll find out more later, [REDACTED]

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Thomson, Andrew
Sent: 2018-May-04 6:19 PM
To: Webb, Allison
Subject: Re: Info re sea lice for Rebecca

Thanks for the summary.

Last years exceedances in Esperanza prompted Karen Calla to look as to what regulatory changes we could make to strengthen our ability to enforce the CoL on sea lice actions. Might be worth talking to her about where those proposed changes went.

Andrew J L Thomson

Regional Director | Directeur Régionale
Fisheries Management Branch | Direction de la gestion des pêches
Pacific Region | Région du Pacifique
Fisheries & Oceans Canada | Pêches et Océans Canada

s.21(1)(a)

s.21(1)(b)

Suite 200 – 401 Burrard St.

Vancouver, BC, Canada V6C 3S4
andrew.thomson@dfo-mpo.gc.ca
Telephone | Téléphone 604.666.0751
Facsimile | Télécopieur 250.666.8069
Government of Canada | Gouvernement du Canada.

From: Webb, Allison
Sent: Friday, May 4, 2018 5:53 PM
To: Thomson, Andrew
Subject: Info re sea lice for Rebecca

DFO requires sea lice counts to be done on salmon as part of our regulatory management under the Conditions of Licence. This information is mandatorily reported to DFO and included in our public reports. There are established thresholds for sea lice counts (from Mar 1 – June 30 – salmon outmigration - it is no higher than 3 motile sea lice per farmed fish). DFO works with the companies to address any exceedances of these thresholds. In this case, DFO has been aware of this situation and working with Cermaq whose treatment has failed. Cermaq has applied to BC MOE to use an alternative treatment (hydrogen peroxide), but has had difficulty getting this approved. We believe that they just received a permit for one of the sites today. In the interim, Cermaq has been harvesting fish as is the typical approach in this situation.

DFO AMD staff conduct sea lice counts throughout the year and double the audit during the salmon outmigration period as part of our regulatory management of the industry. DFO staff confirmed exceedance of the sea lice thresholds for these farms and as above, have been working with Cermaq to address. We do not have any other regulatory tools to require action.

To put this in context, the highest lice loads in this area were 23 lice per fish (that site was harvested and no fish remain), and other sites varied as below (number from March counts)

Ross – 15

Miller – 23

Dixon – 9

Bawden – 9.7

These are at various stages of management. Last year, there were sites in Esperanza Inlet that recorded numbers of about 60 lice/fish (significantly higher). There were no media calls related to that data being posted.

This most recent data has been posted on line within the past two weeks (I have no way to verify the exact date at this time, but I approved some data on April 28th up to Dec 2017 at farm level data and on Mon April 30 the exceedance pie graphs by zone up to March 2018).

The public reports have been posted on our web pages for quite some time and numbers vary by year and time of year.

We are currently investigating this situation and can not comment further in the media regarding whether or not Cermaq has taken appropriate measures consistent with their Action Plan that has been discussed with DFO.

We can update you as further info is received. We are also working actively with the BC MOE to try to facilitate a speedier approval for permits to use hydrogen peroxide when SLICE resistance is demonstrated. We have a meeting scheduled for May 14, 2018. The tools in our toolbox are limited and we will need to work on this.

This has happened a few times before, but generally speaking compliance is good. We continue to follow this closely.

If you have any further questions, please let me know.

Thanks,
Allison

Media Lines attached with Media Release from Clayoquot Action Campaigns below

Issue: [REDACTED] CBC Victoria [REDACTED]
Parksville Qualicum Beach News, [REDACTED]. Looking for response on high levels of sea lice reported at Cermaq Canada farms in BC's Clayoquot area. See press release issued May 5 by Clayoquot Action Campaigns, provided below.

Deadline: Friday, May 5, 4:00 p.m. PST

Recommendation: email approved response

Approved by: Zac Waddington, Allison Webb, Claire Doucette

Media lines:

- DFO is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath).
- Cermaq has applied for a permit but has not yet obtained one from the province of BC. Please contact Cermaq or the Province of BC's Ministry of Agriculture for further information on this process.
- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect.
- DFO is investigating the management of lice at farms in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions and cannot comment further at this time.
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html.

Available at <https://www.wildfirst.ca/clayoqout-action-salmon-lice-outbreak-could-devastate-clayoquot-salmon/>

FOR IMMEDIATE RELEASE:

Salmon lice outbreak could devastate Clayoquot salmon

s.19(1)

Page 114

**is withheld pursuant to section
est retenue en vertu de l'article**

68(a)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

High res photos of Clayoquot May 2018 juvenile salmon with lice and Cermaq salmon lice graphs available here:

<https://drive.google.com/drive/folders/1ps-GumjM4j7RmsYT-kVu1GjJR2oiltqz?usp=sharing>

Cermaq's public reporting webpage: <https://www.cermaq.com/wps/wcm/connect/cermaq-ca/cermaq-canada/our-promise/public-reporting/>

No information has been removed or severed from this page

Manchester, Howie

From: Manchester, Howie
Sent: May-30-18 5:26 PM
To: 'BawdenPoint Farm'
Cc: [REDACTED] Waddington, Zac; Keith, Ian
Subject: RE: Bioassay Lice Collection at Bawden

Hi [REDACTED]

I'm thinking the reference pen may be a good choice but basically whichever pen has the highest number of motile lice. If there is no or little difference between the pens as far as lice abundance then we can go with the reference pen, if not pick a pen with higher numbers. Also to consider is if you just recently handled a pen for lice you may not want to handle that pen again and give it a break.

If anyone else has input please comments.

We will see you on site at about 8:30 am, please let me know if you have any further questions.

Thanks

Howie

From: BawdenPoint Farm [REDACTED]
Sent: May-30-18 2:08 PM
To: Manchester, Howie
Cc: [REDACTED]
Keith, Ian; [REDACTED]
Waddington, Zac
Subject: Re: Bioassay Lice Collection at Bawden

Which pen did you want to sample from?

[REDACTED]

BawdenPoint Farm

CERMAQ

s.16(2)(c)

s.19(1)

Phone [REDACTED]
Direct +1 250-286-0022 ext [REDACTED]

Cermaq Canada Ltd.

Canada

[Cermaq.ca](#) [Facebook](#) [Twitter](#)

From "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>
To [REDACTED]
Cc [REDACTED]

"Keith, Ian" <Ian.Keith@dfo-mpo.gc.ca>,
"Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>

Date 30/05/2018 11 02 AM
Subject Re: Bioassay Lice Collection at Bawden
BawdenPoint Farm

Okay thanks for setting this up [REDACTED] let the site know we will arrive tomorrow morning at Bawden at around 8:30 am at the latest.

Thanks again,

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

From: [REDACTED]
Sent: Wednesday, May 30, 2018 09:19
To: Manchester, Howie
Cc: [REDACTED]
Keith, Ian; [REDACTED] Waddington, Zac;
BawdenPoint Farm
Subject: Re: Bioassay Lice Collection at Bawden

Good morning Howie
Sorry for the late reply but just received conformation from all involved. Yes it is fine to conduct the Sea Lice collection at Bawden Point on Thursday.

[REDACTED] asked to please keep all the lice that die at the lowest levels and all the lice that survive the highest levels in 95% or 100% ethanol

Regards

[REDACTED]

CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

s.16(2)(c)

s.19(1)

Cermaq Canada Ltd.
#203-919 Island Hwy
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>

To [REDACTED]
Cc [REDACTED], "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>, "Keith, Ian" <Ian.Keith@dfo-mpo.gc.ca>

Date 29/05/2018 05:35 PM
Subject Bioassay Lice Collection at Bawden

Hi [REDACTED]

There has or will be some discussions between DFO veterinarians and Cermaq [REDACTED] regarding our DFO team conducting lice collections at Bawden Point in order to complete an independent SLICE bioassay.

We would like to complete the lice collection the morning of Thursday, May 31, sorry for the short notice, but please let me know if you can arrange this activity for this time, as you know we are currently in Tofino and this would be an opportune time for the collection.

We have our own collection equipment and based on the latest abundance numbers at Bawden, I would estimate we need to go through 100 to 150 fish, there will be two of us so I estimate approximately 2 – 3 hours on site and other than catching the fish we would be fairly self-sufficient.

If you would like to discuss further, please don't hesitate to call my cell (see below), either tonight or tomorrow morning, we will be out at Rant Point and Saranac most of the day tomorrow but won't leave the dock until 8:00 am.

Thank you

Howie
Howie Manchester BSc
Senior Aquatic Science Biologist
Fisheries and Oceans Canada / Pêches et Océans Canada
Aquaculture Management Division / Gestion de l'aquaculture
Aquaculture Environmental Operations - Fish Health
#103 2435 Mansfield Drive
Courtenay, B.C.
Telephone | Telephone: 250 703 0916 | Cell: [REDACTED]
Fax: 250 703 0921

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Any unauthorised use, dissemination of the information or copying of this message is prohibited.

s.16(2)(c)

s.19(1)

From: Webb, Allison
To: Waddington, Zac; Doucette, Claire; Paylor, Adrienne
Cc: Sandberg, Krista
Subject: RE: Lice abundance and "absolute sea lice inventory" graphs and data
Date: May-30-18 1:40:38 PM
Attachments: image001.png

Thanks for this info Zac. Important to know and recognise that our approach to managing sea lice will need to evolve as we discussed last week and your team is already actioning. I know that you and/or Adrienne will keep me posted.

Best,
Allison

Allison Webb, Director / Directrice

Aquaculture Management / Gestion de l'aquaculture

Fisheries Management Branch / Direction de la gestion des pêches

Fisheries and Oceans Canada / Pêches et Océans Canada

200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada

604-666-7009

Allison.webb@dfo-mpo.gc.ca

From: Waddington, Zac
Sent: 2018-May-29 2:27 PM
To: Doucette, Claire; Paylor, Adrienne; Webb, Allison
Cc: Sandberg, Krista
Subject: Lice abundance and "absolute sea lice inventory" graphs and data

Please see the link below to look at the graphs which Krista has created outlining the lice levels on farms in Clayoquot, and the respective farm inventories. Of particular note is the tab labelled "Total Lice Abundance" which is plots the "absolute lice inventory" as referenced in Section 6.4(a) of the conditions of licence. You can clearly see that for the months which we have inventory and lice data during the outmigration (March and April), there was a consistent trend upwards of most of the sites, and only in April was there a reduction in absolute lice inventory at two sites (Ross and Millar; both of whom are now harvested out). That leaves Bawden, Dixon Bay, Mussel Rock, Rant and Saranac Island all over threshold with upwards trends in absolute sea lice inventory.

Zac

From: Sandberg, Krista
Sent: May-29-18 12:44 PM
To: Waddington, Zac; Manchester, Howie; Keith, Ian
Subject: RE: bioassay

Hey guys, I've updated all the graphs to include April data, including addition of harvest plans to the harvesting graph. Enjoy ☺

\\sybcvanfp01\aquas\AEO\Courtenay\FH\sea lice management\Sea Lice - Clayoquot graphs 2017.xls

Krista Sandberg

Office | Bureau 250-286-5835

Cellular | Cellulaire [REDACTED]



Government
of Canada

Gouvernement
du Canada

Canada

From: Waddington, Zac

Sent: May-29-18 9:26 AM

To: Sandberg, Krista; Manchester, Howie; Keith, Ian

Subject: Re: bioassay

Thanks a bunch Krista. I know your super busy, but is there anyway you could generate the "absolute sea lice inventory" graph for sites using the April lice and inventory data as was done for March? It'll be important for C and P, I'm expecting to have a meeting with them later this week at some point.

Zac

From: Sandberg, Krista

Sent: Tuesday, May 29, 2018 11:16 AM

To: Manchester, Howie; Waddington, Zac; Keith, Ian

Subject: RE: bioassay

I updated the inventory files yesterday. Miller and Ross are empty, and it looks like they are currently harvesting from Mussel and Saranac with plans to empty Dixon in June.

Krista.

Krista Sandberg

Office | Bureau 250-286-5835

Cellular | Cellulaire [REDACTED]



Government
of Canada

Gouvernement
du Canada

Canada

From: Manchester, Howie

Sent: May-29-18 7:09 AM

To: Waddington, Zac; Keith, Ian

Cc: Sandberg, Krista

Subject: RE: bioassay

s.16(2)(c)

s.19(1)

Thanks for this. I would ask that if we are to go ahead that one of you give [REDACTED] the heads up and let him know we will be contacting [REDACTED] to arrange for Thursday. As for the farms I believe Ross is now empty and Dixon is aggressively harvesting, not sure when harvest ends at Dixon and whether we can get lice while they are harvesting. So as far as who is left to get lice from I believe Bawden is the next candidate. We could look at Saranac and Rant but I don't know if they showed obvious

failure in Krista's graphs.

I'm out in the field all day today but will look at data tonight, If you have time to pick a good candidate site that would be great, anyways keep me posted on whether it's a go or not.

Thanks

Howie

From: Waddington, Zac
Sent: May-29-18 4:34 AM
To: Keith, Ian
Cc: Manchester, Howie
Subject: RE: bioassay

[REDACTED] I am really curious for your opinion when/if [REDACTED] gets back to you with his bioassay results, and if you are satisfied with what he provides. I do not have a minimum testing standard in mind that would satisfy me, but my rationale was that if [REDACTED] provided good evidence of resistance then our own sampling wouldn't be necessary. My thoughts would be that if there's any doubt about whether [REDACTED] bioassay results show resistance, or is he doesn't get them to us in time, then we should just plan to collect our own samples. So at this point I would suggest that Howie and team plan to collect lice on Thursday from the most convenient site with a documented SLICE failure (as based on the graphs Krista generated). I'm not sure of the state of harvest at Ross and Dixon, but they both had quite high lice levels. Does that sound like a workable plan?

Zac

From: Keith, Ian
Sent: May-28-18 6:54 PM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: bioassay

Hey,

[REDACTED] (I'm assuming the meeting is in Quebec.)
I had a response [REDACTED] about missed fish health events but have had no email about bioassay results.
Howie would like to know tomorrow if they are to go ahead on Thursday, so I can phone [REDACTED] tomorrow to ask about bioassays he will be sharing. Is there some minimum that would satisfy you, or is your wish to have our independently collected lice for our own data? I don't know how C&P advised you – [REDACTED]

Thanks

Ian

s.19(1)

s.21(1)(a)

s.21(1)(b)

Pps: Howie was at Fortune today – [REDACTED] fish, March entry, and they are just exceeded threshold now.

I'll ask [REDACTED] tomorrow what the plan is for these fish.

Pps: [REDACTED]

Dr. Ian Keith DVM

Field Operations Veterinarian – Pacific Region

Fisheries and Oceans Canada | Pêches et Océans Canada

Fisheries Management

Aquaculture Management Division | Gestion de l'aquaculture

Aquaculture Environmental Operations – Fish Health

#103 – 2435 Mansfield Drive

Courtenay, British Columbia V9N 2M2

Telephone | Téléphone: 250-703-0917

Mobile | Portable: [REDACTED]

Fax | Télécopieur: 250-703-0921

Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)

s.19(1)

s.20(1)(b)

From: Keith, Ian
To: Manchester, Howie; Waddington, Zac
Subject: RE: Bioassay results [REDACTED]
Date: May-31-18 5:42:11 PM

They've left and Mark Fast replied with a detailed email just in time.
I'll forward it – Mark [REDACTED] I'm glad I asked for detail.
Ian

From: Manchester, Howie
Sent: May-31-18 4:54 PM
To: Waddington, Zac
Cc: Keith, Ian
Subject: Re: Bioassay results [REDACTED]

FYI. Approximately 2000 lice on their way to CAHS., should be there by 6 pm. All went well.

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Waddington, Zac
Sent: Wednesday, May 30, 2018 10:56
To: Manchester, Howie
Cc: Keith, Ian
Subject: Re: Bioassay results [REDACTED]

Hey I've chatted with Ian, whose chatted [REDACTED] and we are a go for live sampling and bioassay at Bawden. [REDACTED] has been working with Mark Fast looking at resistance genetics and so this sample will be able to contribute to that work.

Ian is going to confirm things with [REDACTED] CAHS so we should be good to go there.

Thanks again for making this happen.

s.19(1)

Zac

From: Manchester, Howie
Sent: Wednesday, May 30, 2018 9:48 AM
To: Waddington, Zac; Keith, Ian
Subject: Re: Bioassay results [REDACTED]

Okay, I'm not sure what lice Ben Koop needs, I thought the lice from Bawden were going to CAHS for a Bio assay.

We are and have been collecting lice in ethanol from fortune, Plover, Bare Bluff. We are collecting lice from Saranac and Rant today to ethanol. I assume these are for Ben? We are only collecting 20 to 30 lice in ethanol, I assume this is enough?

Regardless let me know if we are not doing the bioassay as I need to let Cermaq know one way or the other.

Thanks

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Waddington, Zac
Sent: Wednesday, May 30, 2018 06:20
To: Keith, Ian
Cc: Manchester, Howie
Subject: RE: Bioassay results

Yes I am inclined to agree with you Ian. This is way more bioassay data, and more recent then I thought we would get. I'd like to fire an email to Ben Koop and see if he could do anything more with the lice if we were to collect them, but my thoughts are that collecting these lice strictly for a bioassay wouldn't tell us more than we know now that [REDACTED] has shared those results. Sorry for the run around Howie. For now can we leave the plan as is to collect lice at Bawden, but if Ben Koop tells me that the lice wouldn't be of any use to him, then I'm inclined to pull the plug on the sampling and save you guys' time and efforts.

Zac

From: Keith, Ian
Sent: May-30-18 1:11 AM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: FW: Bioassay results

s.19(1)

Hi guys,

Sorry for the blank email – second time today. I thought that only Thom could do this.

[REDACTED] has sent his EC50 values for seven sites. He has a January 2018 for Bawden (pre-treatment), February 2018 for Saranac, and April 2018 for Rant.

He treated only Bawden.

He had no pre-treatment for Millar, Ross, Dixon from Summer/Fall 2017 but has included the post treatment from Millar (December 2017) and Ross (January 2018).

His historic EC50s are pre-treatment (May 2017) and pre-treatment (September 2017) for Saranac where he chose not to treat; he has followed this up with a February 2018 so a helpful time-course. He has included Binns (March 2017) pre-treatment.

It is not unusual to have a 'need to know basis' decision [REDACTED] of whether or not to share data but when pushed he has complied, [REDACTED] he expects these data are ATIP vulnerable.

I will ask [REDACTED] tomorrow morning if Ben Koop has material for his study – he may have told me this but I would have to ask again. I think with or without Ben's analysis, there isn't a future for SLICE use in Clayoquot.

Based on this sharing I don't know that generating more bioassay data is necessary. As I have said, the motivation for generating our own data [REDACTED]

[REDACTED] I think you have to use your instincts, and I used data and my instincts in the past [REDACTED] I would take advantage of it.

Ian

From: Keith, Ian
Sent: May-30-18 12:11 AM
To: Waddington, Zac
Cc: Manchester, Howie
Subject: Bioassay results [REDACTED]

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture
Aquaculture Environmental Operations – Fish Health
#103 – 2435 Mansfield Drive
Courtenay, British Columbia V9N 2M2
Telephone | Téléphone: 250-703-0917
Mobile | Portable: [REDACTED]
Fax | Télécopieur: 250-703-0921
Ian.Keith@dfo-mpo.gc.ca

s.16(2)(c)
s.19(1)
s.21(1)(a)
s.21(1)(b)

Delaney, Paula

From: Paylor, Adrienne
Sent: June-08-18 10:12 AM
To: Webb, Allison
Cc: McCorquodale, Brenda; Lavigne, Lauren
Subject: Fw: sea lice bullets for Allison
Attachments: Bullets on sea lice situation to brief Andy.docx

Allison attached bullets for you to brief Andy. Let me know if you need more info.

Thanks

Adrienne

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Friday, June 8, 2018 9:29 AM
To: Paylor, Adrienne
Subject: RE: Can you clean this up for Allison 4 me?

Take a peek and see what you think.

Zac

From: Paylor, Adrienne
Sent: June-08-18 8:26 AM
To: Waddington, Zac
Subject: Can you clean this up for Allison 4 me?

Bullets on sea lice situation to brief Andy

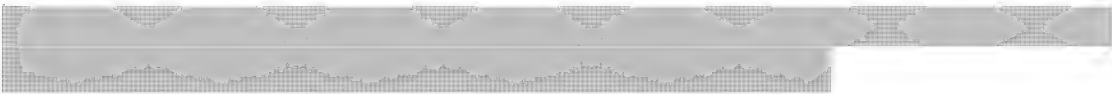
Bullets on sea lice situation to brief Andy

- Numerous Cermaq farms in Clayoquot are experiencing extremely high sea lice counts this spring.
- Experienced FH staff say this is the worst lice burden they have ever seen with an estimated 80 to 100 lice per fish seen during the most recent audits in the area in May.
 - FH staff have collected sea lice from the Bawden site and sent them to the Coastal Aquatic Health Center for genetic and bioassay studies which confirmed SLICE resistance.
- Documented SLICE failures have occurred at numerous locations on the west coast: Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot sound in 2018.
 - Bioassay results conducted by industry and shared with DFO have confirmed that the lice are much more resistant to SLICE than wildtype lice.
- Area based SLICE treatments conducted in September and early October 2017 in Clayoquot had much lower effect than expected and resulted in lice numbers remaining high entering into 2018. SLICE resistance was documented by Cermaq's veterinarian.
- Cermaq's application for the use of peroxide (Paramove) was delayed by public opposition/consultation in Tofino and as a result their only management option remaining was harvest.
- In March 2018 four Cermaq farms were over threshold heading into the out migration window which included Bawden, Dixon, Miller and Ross.
 - Saranac quickly became over threshold by the middle of March.
 - In April 2018 Millar was harvested out and only Ross Pass was able to lower their "absolute sea lice inventory" in the month of April as defined in CoL, and was harvested out by the end of April.
 - Mussel Rock and Rant sites also went over the threshold in April and continue to be above.
 - Dixon Bay is being harvested rapidly and has also suffered a mortality event due to low oxygen, so it should be empty very shortly.
 - This leaves four farms that will have had elevated lice levels throughout the entirety of the outmigration period.
- A pesticide use permit (PUP) has recently been granted by the BC Ministry of Environment for Clayoquot and peroxide treatment is underway at Bawden and Plover Point.
- The failure by numerous farms to "implement a plan which will reduce the absolute sea lice inventory within the containment structure array," (CoL 6.4 (a)) may/should represent a non-compliance with CoL. [REDACTED]
- Moving forward it is imperative that no additional SLICE treatments occur in Clayoquot until at least after the fall adult migration occurs and bioassays show resistance genetics have been diluted from the sea lice population by the influx of wildtype lice.

s.21(1)(a)

s.21(1)(b)

s.23

- It is recommended that Cermaq demonstrate that they have the technology, training and capacity to treat all farms in Clayoquot in a timely manner without reliance on SLICE before restocking farms being harvested out.
- 
- This situation has highlighted the shortcomings of “harvest” as a management tool since harvest capacity at processing plants and harvest vessels is fixed and companies try to ensure they maintain peak efficiencies; therefore there is generally not additional capacity to allow harvesting as a management tool. This limitation has been encountered with all three major salmon farming companies, in three of the past four outmigration periods.
- Without effective enforcement, companies have a perverse incentive to use harvest as a management tool during the outmigration, which meets the letter of the CoL, but certainly not the spirit or objective of preventing undue lice challenge to outmigrating smolts.

Could talk about amending the licence to change the sea lice section at large???

s.21(1)(a)

s.21(1)(b)

Paylor, Adrienne

From: Paylor, Adrienne
Sent: June-08-18 3:09 PM
To: Webb, Allison
Subject: [REDACTED]
Attachments: [REDACTED]

[REDACTED]
Adrienne

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Friday, June 8, 2018 8:22 AM
To: Paylor, Adrienne
Cc: Webb, Allison
Subject: [REDACTED]

Yeah I can't open the old one now either...
Please take a peek at the attached documents. [REDACTED]
[REDACTED]

Zac

From: Paylor, Adrienne
Sent: June-08-18 7:41 AM
To: Waddington, Zac
Cc: Webb, Allison
Subject: [REDACTED]

Can you send [REDACTED] to Allison. My BlackBerry won(decode it.
Thx Adrienne

Sent from my BlackBerry 10 smartphone on the Rogers network.

s.19(1)
s.21(1)(a)
s.21(1)(b)
s.23

**Pages 130 to / à 168
are withheld pursuant to section
sont retenues en vertu de l'article**

23

**of the Access to Information Act
de la Loi sur l'accès à l'information**

Paylor, Adrienne

From: Paylor, Adrienne
Sent: June-08-18 3:04 PM
To: Waddington, Zac
Subject: Re: Can you clean this up for Allison 4 me?

Excellent thanks so much! I have passed them on to Allison so if anything else comes up to add just send it directly to her and cc me. 

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Waddington, Zac
Sent: Friday, June 8, 2018 9:29 AM
To: Paylor, Adrienne
Subject: RE: Can you clean this up for Allison 4 me?

Take a peek and see what you think.

Zac

From: Paylor, Adrienne
Sent: June-08-18 8:26 AM
To: Waddington, Zac
Subject: Can you clean this up for Allison 4 me?

Bullets on sea lice situation to brief Andy

Cermaq farms in Clayoquot counts are experiencing extremely high sea lice counts this spring AEO fish health have identified widespread SLICE resistance on the west coast of Vancouver Island, documented in Esperanza in 2017 and now Clayoquot in 2018. In March 2018 five Cermaq farms were over threshold heading into the out migration window which included Bawden, Dixon, Miller, Ross and Saranc. In April 2018 Millar was harvested out and only Ross Pass was able to lower their absolute sea lice inventory as defined in CoL. Mussel Rock and Rant sites went over the threshold. Experienced FH staff say this is the worst they have ever seem with an estimated 80 to 100 lice per fish be May. FH staff have collected sea lice from the Bawden site and sent them to the Coastal Aquatic Health Center for genetic and bioassay studies. SLICE resistance was confirmed. Moving forward it is imperative that no additional SLICE treatments occur in Clayoquot until after the fall adult migration occurs and bioassays show resistance had been eliminated from the sea lice population. A mandatory fallowing period may be required before farms are allowed to restock???. The department must expedite it IPM initiatives and consider Area Based Management approaches to sea lice management. Currently there are limited options for sea lice management without the use of SLICE in BC leaving only H2O2 if they can get through consultaion and get a permit from the province or harvest the fish out.

Excellerated harvest has been an acceptable submitted plan in the past however implementation of this plan has proven challenging do to limited capacity of harvest vessels and processing plants, weather delays and diverted resources to sites that go over biomass limits.

Economic losses from removing fish prior to market size provides indusrty incentive to drag out the harvest.

Sent from my BlackBerry 10 smartphone on the Rogers network.

No information has been removed or severed from this page

DRAFT

MEDIA LINES

Title

Issue:

A number of farms in British Columbia's Clayoquot Sound area, all owned by Cermaq Canada, are experiencing extremely high sea lice counts this spring. This has already received media attention and lines have been approved.

Since then, lab tests have confirmed that the sea lice at least one of the farms are resistant to SLICE, which is the chemical treatment most widely used to control sea lice in BC. A "responsive" section has been added to media lines in anticipation of further media requests.

Media lines:

- Fisheries and Oceans Canada (DFO) is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels. **approved**
- The Department is reviewing Cermaq Canada's sea lice management practices at these farms to determine if relevant licence conditions have been followed appropriately. **approved**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Environment for further information on this process. **approved**

u:\documents\atips\slice resistance oct. 2018\ml_aqua_sealiceclayoquot.doc

DRAFT

- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect. **approved**
- Our fish health veterinarians have requested documentation to determine the appropriateness of treatments undertaken at these farms, and to ensure that all other treatment and harvest options were duly considered by Cermaq. Financial considerations would not be recognized as justification for exclusion of otherwise effective lice management options. **approved**
- This is not a formal investigation under the Fisheries Act or regulations; however, if there has been non-compliance with the licence conditions, DFO will address the matter with an appropriate enforcement response. **approved**

Responsive on SLICE resistance (new)

- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. **new**
- In BC to date, SLICE has generally been a very effective tool in the management of sea lice at salmon farms, and during most years, Most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). **new**
- Documented SLICE failures have occurred at other times in British Columbia: at Klemtu in 2015, Esperanza Inlet in 2017 and Clayoquot sound in 2018. **new**
- Research is under way, by DFO, industry, and globally, to find alternative methods to manage sea lice. DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at <http://www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm>. **new**

Spokesperson:

Program Contact:

Communications Contact:

u:\documents\atips\slice resistance oct. 2018\ml_aqua_sealiceclayoquot.doc

Created on: 13-Jun-18
Created by: Hélène Taché
Docket #:

Last saved by: DFO-MPO
Revised: 13-Jun-18 3:25 PM

Paylor, Adrienne

From: Webb, Allison
Sent: June-13-18 4:10 PM
To: Delaney, Paula; Barton, Meagan
Cc: Paylor, Adrienne
Subject: Sea lice BN
Attachments: Sea Lice-Memo-...ap&aw.june13.18.docx

Hi Paula – can you please work with Meagan to get this to Andy. He requested this to be sent to the DM as an info note.

For info notes, is the section asking for a recommendation necessary or can it be deleted? We weren't sure and haven't included it here. Please advise.

Thanks,
Allison



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Sector

Secteur

S/ADM Title

Titre de SMA/P

Issue subject to screen. Not to be shown to Minister LeBlanc. (if appropriate)

UNCLASSIFIED

20##-###-#####

EKME #: #####

MEMORANDUM FOR THE DEPUTY MINISTER

**SEA LICE MANAGEMENT ISSUE IN PACIFIC REGION
(FOR INFORMATION)**

SUMMARY OF ADVICE TO DEPUTY MINISTER

The purpose of this note is to bring to your attention a growing pattern of sea lice management challenges on the west coast of Vancouver Island.

Within the last three years the department has become aware of elevated sea lice levels for a variety of sites in Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot Sound in 2018. Currently management approaches have not been ineffective to reduce the lice loads.

This situation has raised media attention and public concern over potential harm to salmon smolts during out migration periods. The department will have to take action to address the shortcomings of sea lice management approaches in the Pacific Region.

Immediate next steps include internal discussions [REDACTED] and continued collaboration with Communications to respond to media and public inquiries.

Medium to long term actions will include consultation with Science, Industry and the province on improved Integrated Pest Management approaches and potential changes to condition of licence.

BACKGROUND

Numerous Cermaq farms in Clayoquot Sound are experiencing extremely high sea lice counts (80 to 100 lice per fish) this spring. When lice levels cannot be managed there is spillover of farmed lice onto migrating smolts increasing the risk of detrimental effects to wild fish.

s.21(1)(b)

s.23

.../2

At present, there are few options available to the aquaculture industry to reduce the sea lice loads below the DFO threshold. Until recently, the only drug available has been emamectin benzoate known as SLICE. Area based SLICE treatments conducted in September and early October 2017 in Clayoquot had much lower effect than expected and resulted in lice numbers remaining high into 2018. The other concern is that there appeared to be resistance to SLICE. Aquaculture Management staff have collected sea lice samples from one of the 7 sites over regulatory thresholds and have confirmed SLICE resistance.

Alternative treatment was pursued by Cermaq however their application for the use of hydrogen peroxide (Paramove) was delayed by public opposition/consultation in Tofino and as a result their only management option remaining was harvest.

Accelerated harvest is challenged by capacity at processing plants and harvest vessels limiting its effectiveness as a management tool. In the case of Clayoquot in 2018, there were also demands for harvesting efforts to be redirected other farms to ensure they remained below the maximum tonnage of fish allowed on the farm according to conditions of licence (CoL). Failure to harvest on an accelerated timeline increases the risk to wild outmigrating salmon smolts and may represent non-compliance with CoL.

STRATEGIC CONSIDERATIONS

This situation has highlighted the shortcomings of "harvest" as a management tool since harvest capacity at processing plants and harvest vessels is fixed and companies try to ensure they maintain peak efficiencies; therefore there is generally not additional capacity to allow harvesting as a management tool. This limitation has been encountered with all three major salmon farming companies, in three of the past four outmigration periods.

DFO Aquaculture Management is considering different options such as mandatory fallowing as well as further research into the thresholds used for regulatory management of sea lice.

SCIENCE ADVICE

DFO Aquaculture will consider whether more research is necessary and work with Science as appropriate.

INTERDEPARTMENTAL CONSULTATIONS

N/A

INDIGENOUS CONSULTATIONS

s.21(1)(a)

s.21(1)(b)

s.23

.../3

Once options are identified, DFO will consider the most appropriate approach to consultations with First Nations.

EXTERNAL CONSULTATIONS

Aquaculture Management plans to engage with industry through our advisory process to highlight the need for an improved approach to management going forward.

ADVICE AND RECOMMENDATIONS TO DEPUTY MINISTER

When the memo is for information, this section presents the conclusion of the memo.

When relevant, next steps can also be identified.

When the memo is for decision, this section presents the recommendation(s) for the Deputy Minister.

S/ADM Signature Block

Other ADM Signature Block (if applicable)

(Signature block below is for decision only)

- ☐ I concur with the recommendations
- ☐ I do not concur with the recommendations

Catherine Blewett
Deputy Minister

Kevin Stringer / Jeffery Hutchinson
Associate Deputy Minister / Commissioner

Attachment(s): (#) *(if applicable)*

- 1) Description of the attachment(s)



Fisheries and Oceans Canada
Correspondence Routing Slip

Fiche d'acheminement de correspondance
Pêches et Océans Canada

CLASSIFICATION
GCCMS #: 20##-###-#####
EKME #: #####

To: Catherine Blewett
Pour:

Date:

Object: TITLE
Objet: TITRE

From / Name of DG, Title
De:

Via: Name of S/ADM, Title

Additional approvals:
Autre(s) approbation(s):

☐ Material for the Minister
Documents pour le Ministre

☐ Your Signature
Votre signature

☐ Information

Screen: The Department has assessed this issue in full.
Filtre: ☐ It contains no reference to matters covered by the screen relating to J.D. Irving Limited.
☐ It contains matters referenced in the screen relating to J.D. Irving Limited, but in our view does not engage the screen.
☐ In our view, the screen relating to J.D. Irving Limited should be engaged.

Remarks: This briefing note was developed in consultation with the following
Remarques: regions/sectors: [please list who was consulted internally]

Distribution: *Please indicate name of people to receive a copy and if prior or following the DM approval. (Remove text if no Distribution is required)*

Drafting Officer/
Rédacteur:

NAME (TEL #)/ Director / admin initials

Dickie, Catherine

From: Lowe, Carmel
Sent: June-14-18 1:30 PM
To: McPherson, Arran; Laverdure, Louise; Moore, Wayne
Cc: XPAC SC Executive
Subject: FW: ROCS Update - Week of June 11, 2018

fyi

Carmel

Carmel Lowe, Ph.D
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Chin, Jena
Sent: June 14, 2018 9:12 AM
To: Thomson, Andrew <Andrew.Thomson@dfo-mpo.gc.ca>
Cc: O'Grady, Liane <Liane.OGrady@dfo-mpo.gc.ca>; Carlson, Mike <Mike.Carlson@dfo-mpo.gc.ca>; Fulks, Jay <Jay.Fulks@dfo-mpo.gc.ca>; Masson, Colin <Colin.Masson@dfo-mpo.gc.ca>; Murdoch, Sarah <Sarah.Murdoch@dfo-mpo.gc.ca>; Gotch, Steve <Steve.Gotch@dfo-mpo.gc.ca>; Bate, Angela <Angela.Bate@dfo-mpo.gc.ca>; Nener, Jennifer <Jennifer.Nener@dfo-mpo.gc.ca>; Brown, Laura (Pacific) <Laura.L.Brown@dfo-mpo.gc.ca>; Collie, Tyler <Tyler.Collie@dfo-mpo.gc.ca>; Kotyk, Mel <Mel.Kotyk@dfo-mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Smith, Ken <Ken.Smith@dfo-mpo.gc.ca>; Cheung, Alice <Alice.Cheung@dfo-mpo.gc.ca>; Gallant, Nicole <Nicole.Gallant@dfo-mpo.gc.ca>; Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>; Kerr, Lisa <Lisa.Kerr@dfo-mpo.gc.ca>; Russow, Theona <Theona.Russow@dfo-mpo.gc.ca>; Webb, Cheryl <Cheryl.Webb@dfo-mpo.gc.ca>; Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Whelan, Christie <Christie.Whelehan@dfo-mpo.gc.ca>; Prince, Dave <Dave.Prince@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Holmes, John <John.Holmes@dfo-mpo.gc.ca>; Taylor, Nathan <Nathan.Taylor@dfo-mpo.gc.ca>; Houston, Kim <Kim.Houston@dfo-mpo.gc.ca>; MacDougall, Lesley <Lesley.MacDougall@dfo-mpo.gc.ca>; Klaver, March <March.Klaver@dfo-mpo.gc.ca>; Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>; Davis, Neil <Neil.Davis@dfo-mpo.gc.ca>; Bonnet, Terri <Terri.Bonnet@dfo-mpo.gc.ca>; Mah, Richard <Richard.Mah@dfo-mpo.gc.ca>
Subject: ROCS Update - Week of June 11, 2018

Hi Andy,

There were six paragraphs submitted this week. Three were recommended for ROCs submission during the meeting. The ROCS team felt that the fourth paragraph regarding *2018 Pink Shrimp Survey* was not ROCS worthy. The 5th paragraph on *Harmful Algal Blooms* was submitted after the meeting therefore was not discussed.

Trans Mountain Expansion Project: DFO Issued Warning Letter to Trans Mountain for Non Compliance with Fisheries Act Authorization

The Fisheries Protection Program, Pacific Region, issued a warning letter to Trans Mountain on June 6, 2018 associated with Trans Mountain's failure to comply with conditions of its *Fisheries Act* authorization, which was issued in September 2017

for the expansion of the Westridge Marine Terminal in Burrard Inlet. The warning letter was issued because the proponent failed to define and maintain a suitable marine mammal exclusion zone; exceeded the underwater threshold set to protect finfish while impact pile driving and failed to cease pile driving immediately and contact DFO to discuss mitigation methods; failed to share its monitoring reports with the Indigenous Advisory and Monitoring Committee (IAMC); and failed to provide a report containing information relating its non-compliance to DFO and the IAMC. The proponent has taken remedial steps. DFO is not aware of any negative impacts to marine mammals or finfish due to the breach of conditions. Members of the Indigenous caucus of the IAMC were provided with a copy of the June 6 warning letter and requested that they be permitted to circulate the letter to their communities. DFO agreed to this request. The warning letter has since been provided to the National Observer, a Canadian news website focused on investigative reporting and daily news on energy, climate, politics and social issues. An article mischaracterizing DFO's compliance monitoring at the Westridge Marine Terminal was posted June 12. (<https://www.nationalobserver.com/2018/06/12/news/leaked-letter-reveals-kinder-morgan-broke-rules-months-canadian-officials-noticed>). DFO communications has since responded to the National Observer's addition requests for information.

Sea Lice

This year there are a number of farms in the Clayoquot Sound area that have experienced sea lice at elevated levels which are over our current thresholds. Treatments have not been effective at reducing lice levels and have highlighted broader issues in terms of management approaches. Media has been interested in this story and there have been a number of articles/interviews in May, but no current follow up. DFO staff continue to work with industry (Cermaq) to address this issue. As elevated lice levels have occurred in various areas in the past number of years, DFO Aquaculture Management Division staff are working with Conservation & Protection [REDACTED]

[REDACTED] AMD is also discussing this with industry in hopes of finding a more proactive approach in future. DFO will continue to monitor this issue and has media lines prepared should there be any further inquiries.

Haisla First Nations concerns with pending opening of Kitimat River to recreational chinook angling

On May 07th the Department closed all streams entering the North and Central Coast of BC to chinook angling, however, it was noted that retention may be permitted on streams with larger enhanced stocks which was specifically intended to include the Kitimat River. A major hatchery facility has operated on the Kitimat for over 30 years, primarily enhancing chinook and chum. In the recent decade approximately 2 million chinook smolts have been released annually and Salmon Stock Assessment has indicated that this chinook stock is deemed to be 'enhanced' with no genetically wild component likely to exist. While escapement is not officially estimated some tributary observations note a decline in abundance in recent years, although the hatchery anticipates no difficulty in collecting the required broodstock. The Sport Fish Advisory Board (and local committee) support an additional angling measure to prevent the retention of larger (age 5) chinook to provide additional spawning capacity throughout the watershed as a precautionary measure. The Haisla First Nation have objected to the pending opening claiming both a potential impact to their ability to meet foods and ceremonial (FSC) requirements (< 200 annually), and a conservation concern for Kitimat chinook. North Coast Area staff are meeting with the Haisla Nation on June 15th to consult further and to better understand their concerns. Given the abundance known to be available for FSC purposes, and unless new rationale becomes apparent, it is proposed to open the recreational fishing opportunity for chinook on the Kitimat as originally approved on or about June 22, 2018.

Potential Shellfish Harvesting Activity by Semiahmoo First Nation in Boundary Bay

Chief Harley Chappell from the Semiahmoo First Nation contacted staff in the Fraser & Interior Area on June 13th indicating that Semiahmoo plans to undertake bivalve fishing activities in the Boundary Bay area on Friday, June 15th to practice their Aboriginal rights and share traditional teachings with their youth. All of Boundary Bay has been closed and bivalve shellfish harvesting has been prohibited since 1965 due to long-standing water quality concerns. As such Canadian Shellfish Sanitation Program (CSSP) water quality and biotoxin testing are not currently conducted in the Boundary Bay. However, currently in many adjacent areas in Canadian waters, there are biotoxin closures. There is also a biotoxin and pollution closure in adjacent the Washington State areas south of the border. The Chief has shared that he is informing his community of the concerns with consuming shellfish harvested from the Bay but that some members may still decide to eat clams from the beach. DFO Staff are supportive of the activity in maintaining the practice and providing an opportunity for elders to teach their community members but are seriously concerned about the potential health implications if shellfish is

consumed. In response area staff will be following up on Thursday afternoon through a further discussion with the Chief and a letter to the community outlining the concerns with consumption of shellfish from the area at this time, sharing resources regarding the risks, and indicating that enforcement actions may be taken should officers observe bivalves leaving the harvest site. Conservation & Protection officers from the Langley detachment are planning to observe any activity from afar to not disturb the event. Of note, similar information has been shared verbally and in writing by DFO and Environment and Climate Change Canada (ECCC) staff with Semiahmoo over the past year after a similar incident in June 2017. DFO staff are also currently working with Semiahmoo on developing an Appendix XIII proposal from Semiahmoo to the Pacific Region Interdepartmental Shellfish Committee (PRISC) and CSSP for a review and reclassification of Boundary Bay.

***OPTIONAL* 2018 Pink Shrimp Survey Index Values along WCVI in the Critical Zone**

Preliminary results from the annual biomass index survey of pink shrimp stocks off the west coast of Vancouver Island indicate that 2018 will be the third consecutive year of low shrimp abundance after two years of record high abundance in 2014 and 2015. Environmental conditions (temperature) drives recruitment in pink shrimp, which display an inverse relationship between sea temperatures and abundance. These cycles in abundance may becoming shorter, from ~7 years in the mid-1990s to 3-4 years in the mid-2000s. The pink shrimp survey biomass index is used by Fisheries Management branch to set quotas for the shrimp by trawl fishery. When the shrimp biomass index falls into the Critical Zone, the area is closed to fishing. Fisheries Managers have been notified that the 2018 pink shrimp biomass index for both inshore and offshore areas off the southwest coast of Vancouver Island will likely be in the Critical Zone. A full analysis of the survey results will be completed by mid-July and provided to Fisheries Managers.

***OPTIONAL* Harmful Algal Blooms**

There are a number of areas north of Campbell River experiencing outbreaks of harmful algal blooms. These are naturally occurring and periodic in coastal BC. Most recently, a harmful algal bloom caused a mass mortality in the Sechelt area which was reported through ROCS last week. While no significant mortalities have been reported to DFO as of yet, staff are monitoring this closely and working with Communications staff to have media lines ready in the case that this is reported. DFO has a well-established reporting structure that is required for these types of events and compliance is typically high from the companies.

Cheers,

Jena Chin

Integrated Aboriginal Programs Coordinator
Aboriginal Programs Division
Jena.Chin@dfo-mpo.gc.ca
Tel: 604.666.2410

Attachment at pages 184 to 186

From: Rainer, Michelle
To: Waddington, Zac
Subject: FW: Sea lice update
Date: June-14-18 8:50:18 AM
Attachments: ML_AQUA_SeaLiceClayoquot.doc
Importance: High

Hi Zac,

In light of the below, I have updated the Cermaq sea lice lines but thought the section on your review of their records might be out-of-date. Can you please review and update as needed?

Thanks,
Michelle


From: Webb, Allison
Sent: Tuesday, June 12, 2018 7:48 PM
To: Thomson, Andrew; LaRue, Jean-François
Cc: Girouard, Louise
Subject: Sea lice update

Andy and JF – Just a heads up on an issue that has been playing out recently and on which our team is spending significant time. I wanted you to be aware. No additional media attention has followed after the initial stories in Clayoquot Sound.

Please feel free to inform others like Rebecca as necessary.

- Numerous Cermaq farms in Clayoquot Sound are experiencing extremely high sea lice counts this spring. This is of concern for a number of reasons including timing of out migration of wild salmon smolts, indications of SLICE resistance and limited regulatory tools to address this situation.
- Experienced FH staff note that this is the worst lice burden they have ever seen with an estimated 80 to 100 lice per fish seen during the most recent audits in the area in May.
 - FH staff have collected sea lice from the Bawden site and sent them to the Coastal Aquatic Health Center for genetic and bioassay studies which confirmed SLICE resistance.
- Documented SLICE failures have occurred at numerous locations on the west coast: Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot sound in 2018 increasing our need to find more effective management approaches to address this situation.
- Area based SLICE treatments conducted in September and early October 2017 in Clayoquot had much lower effect than expected and resulted in lice numbers remaining high entering into 2018. SLICE resistance was documented by Cermaq's veterinarian.
- Cermaq's application for the use of peroxide (Paramove) was delayed by public

opposition/consultation in Tofino and as a result their only management option remaining was harvest.

- In March 2018 four Cermaq farms were over threshold heading into the out migration window which included Bawden, Dixon, Miller and Ross.
- A pesticide use permit (PUP) has recently been granted by the BC Ministry of Environment for Clayoquot and peroxide treatment is underway at Bawden and Plover Point.
- The failure by numerous farms to “implement a plan which will reduce the absolute sea lice inventory within the containment structure array,” (CoL 6.4 (a)) may/should represent a non-compliance with CoL.
- We have been working with Cermaq (who have voluntarily withdrawn their ASC certification as they recognize that this is not being managed in a way consistent with the ASC), but are concerned that they may not be meeting the COL
- 
- We plan to raise this with industry through our advisory process to highlight the need for an improved approach to management going forward. We flagged this with BCSFA and they agreed that this was important.

Forward Options for consideration

- no additional SLICE treatments occur until at least after the fall adult migration occurs and bioassays show resistance genetics have been diluted from the sea lice population by the influx of wildtype lice.
- A mandatory fallowing period may be indicated before farms are allowed to restock.
- This situation has highlighted the shortcomings of “harvest” as a management tool since harvest capacity at processing plants and harvest vessels is fixed and companies try to ensure they maintain peak efficiencies; therefore there is generally not additional capacity to allow harvesting as a management tool. This limitation has been encountered with all three major salmon farming companies, in three of the past four outmigration periods.
- Changes may be required to the conditions of licence and consideration given to the current thresholds for sea lice management

s.21(1)(a)

s.21(1)(b)

s.23

Paylor, Adrienne

From: Rainer, Michelle
Sent: June-14-18 2:21 PM
To: Webb, Allison; Paylor, Adrienne
Subject: ML_AQUA_SealIceClayoquot.doc
Attachments: ML_AQUA_SealIceClayoquot.doc

Hi Allison and Adrienne,
Please see updated lines, with new section on SLICE resistance. Zac has approved.
Thanks,
Michelle

DRAFT

MEDIA LINES

Title

Issue:

A number of farms in British Columbia's Clayoquot Sound area, all owned by Cermaq Canada, are experiencing extremely high sea lice counts this spring. This has already received media attention and lines have been approved.

Since then, lab tests have confirmed that the sea lice at least one of the farms are resistant to SLICE, which is the chemical treatment most widely used to control sea lice in BC. A "responsive" section has been added to media lines in anticipation of further media requests.

Media lines:

- Fisheries and Oceans Canada (DFO) is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels. **approved**
- The Department is reviewing Cermaq Canada's sea lice management practices at these farms to determine if relevant licence conditions have been followed appropriately. **approved**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the

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Created on: 14-Jun-18 6-Apr-11
Created by: Hélène Taché
Docket #:

Last saved by: DFO-MPOZacW
Revised: 14-Jun-18 2:20 PM 12:49 PM

DRAFT

Province of BC's Ministry of Environment for further information on this process. **approved**

- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect. **approved**
- Our fish health veterinarians have requested documentation to determine the appropriateness of treatments undertaken at these farms, and to ensure that all other treatment and harvest options were duly considered by Cermaq. Financial considerations would not be recognized as justification for exclusion of otherwise effective lice management options. **approved**
- This is not a formal investigation under the Fisheries Act or regulations; however, if there has been non-compliance with the licence conditions, DFO will address the matter with an appropriate enforcement response. **approved**

Responsive on SLICE resistance (new)

- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. **new**
- In BC SLICE has generally been a very effective tool in the management of sea lice at salmon farms. During most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). **new**
- SLICE resistance is an emerging issue in BC, with failures of treatment documented at Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot sound in 2018. **new**
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm. **New**
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach. **New**

Spokesperson:

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Created on: 14-Jun-18 6-Apr-14
Created by: Hélène Taché
Docket #:

Last saved by: DFO-MPOZacW
Revised: 14-Jun-18 2:20 PM 12:49 PM

DRAFT

Program Contact:

Communications Contact:

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Created on: 14-Jun-18 6:44
Created by: Hélène Taché
Docket #:

Last saved by: DFO-MPOZacW
Revised: 14-Jun-18 2:20 PM 12:49 PM

Paylor, Adrienne

From: Webb, Allison
Sent: June-14-18 2:53 PM
To: Rainer, Michelle
Cc: Paylor, Adrienne
Subject: RE: Updates to Clayoquot sea lice lines for approval

I think it's too early and we need to come to ground more on some of these things before proposing lines. Tx.

From: Rainer, Michelle
Sent: Thursday, June 14, 2018 2:37 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Cc: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>
Subject: RE: Updates to Clayoquot sea lice lines for approval

We could send the lines up in the package for the DM.

From: Webb, Allison
Sent: June-14-18 2:33 PM
To: Rainer, Michelle
Cc: Paylor, Adrienne
Subject: RE: Updates to Clayoquot sea lice lines for approval

Yes keep them in the back pocket for now. We were asked to brief the DM on this and she hasn't received our BN yet so I would be worried about putting info in the media that she isn't aware of yet.

From: Rainer, Michelle
Sent: Thursday, June 14, 2018 2:26 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Cc: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>
Subject: RE: Updates to Clayoquot sea lice lines for approval

Oops, I sent the lines before I saw this. The main section was already approved, so if you would like to take out the new section entirely there's no further action on this. We can keep those lines in our back pocket if needed.
Michelle

From: Webb, Allison
Sent: June-14-18 2:14 PM
To: Rainer, Michelle
Cc: Paylor, Adrienne
Subject: RE: Updates to Clayoquot sea lice lines for approval

Thanks. I'm a bit concerned about the newly added lines. We may need to keep with the status quo for now. Tx.

From: Rainer, Michelle
Sent: Thursday, June 14, 2018 8:47 AM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Cc: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>
Subject: RE: Updates to Clayoquot sea lice lines for approval

Hi again,

On second thought, I sent this to Zac first in case he has updates on his review of the records. Sorry, will resubmit when ready.

Michelle

From: Rainer, Michelle

Sent: June-13-18 3:23 PM

To: Webb, Allison

Cc: Paylor, Adrienne

Subject: Updates to Clayoquot sea lice lines for approval

Hi Allison and Adrienne,

For your review. Please see the lines marked "new" at the end.

Thanks,

Michelle

Issue:

A number of farms in British Columbia's Clayoquot Sound area, all owned by Cermaq Canada, are experiencing extremely high sea lice counts this spring. This has already received media attention and lines have been approved.

Since then, lab tests have confirmed that the sea lice at least one of the farms are resistant to SLICE, which is the chemical treatment most widely used to control sea lice in BC. A "responsive" section has been added to media lines in anticipation of further media requests.

Media lines:

- Fisheries and Oceans Canada (DFO) is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels. **approved**
- The Department is reviewing Cermaq Canada's sea lice management practices at these farms to determine if relevant licence conditions have been followed appropriately. **approved**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Environment for further information on this process. **approved**

- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect. **approved**
- Our fish health veterinarians have requested documentation to determine the appropriateness of treatments undertaken at these farms, and to ensure that all other treatment and harvest options were duly considered by Cermaq. Financial considerations would not be recognized as justification for exclusion of otherwise effective lice management options. **approved**
- This is not a formal investigation under the Fisheries Act or regulations; however, if there has been non-compliance with the licence conditions, DFO will address the matter with an appropriate enforcement response. **approved**

Responsive on SLICE resistance (new)

- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. **new**
- In BC to date, SLICE has generally been a very effective tool in the management of sea lice at salmon farms, and during most years, Most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). **new**
- Documented SLICE failures have occurred at other times in British Columbia: at Klemtu in 2015, Esperanza Inlet in 2017 and Clayoquot sound in 2018. **new**
- Research is under way, by DFO, industry and globally, to find alternative methods to manage sea lice. DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at <http://www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm>. **new**

McCorquodale, Brenda

From: Rainer, Michelle
Sent: Thursday, June 21, 2018 12:01 PM
To: Shaw, Kerra
Cc: Waddington, Zac; Manchester, Howie; Paylor, Adrienne; McCorquodale, Brenda
Subject: RE: Sea lice herring

Hi Kerra,

I have done science lines. Simon Jones says he couldn't identify the type of lice from the photos. In any event I think this covers it so I'm not sure we need anything from aquaculture program, unless you guys would like to add something. I FYI'd Allison on the below:

Issue: Reports and photos of dead herring infested with sea lice in the Hot Springs Cove area near Tofino are being shared on Facebook, with claims that the event is linked to salmon farming:

https://www.facebook.com/zoceanfox?hc_ref=ARQY9qmSvyzCa8619RpZVtAj0IvD3YzpNX8t8k1b-clC4wiqOL5hq3xLBtFO0ACuNBI&fref=nf&hc_location=group Media inquiries may follow.

Deadline: Anticipatory

Recommendation: Email response. Science spokes not available today.

Approved by: Simon Jones, Mark Higgins

Media lines:

- Herring die-offs are not unusual at this time of year as the weather warms up and ocean temperatures rise, creating ideal conditions for diseases caused by viruses and algal blooms.
- Sea lice are a naturally occurring ocean parasite that affect many species of fish, including herring. Sea lice do not generally cause mortality in herring.
- Fisheries and Oceans Canada (DFO) staff will visit the site and collect samples that will be used to study the cause of this mortality event.

From: Shaw, Kerra
Sent: June-21-18 11:06 AM
To: Rainer, Michelle
Subject: FW: Sea lice herring

Hey Michelle – just making sure you're aware of what is going on in the media regarding sea lice on wild fish in Clayoquot? I'm just with Howie and Zac so this message is really on behalf of them – may need media lines? Howie has id'd fish as wild herring and the sea lice are caligus not leps (e.g. not from farms) and he is collecting other background info.

Please talk to Zac, Adrienne and Howie for more!

From: Paylor, Adrienne
Sent: June-21-18 8:44 AM
To: Shaw, Kerra
Subject: FW: Sea lice herring

From: McCorquodale, Brenda
Sent: June-21-18 8:03 AM
To: Paylor, Adrienne; Webb, Allison
Subject: Re: Sea lice herring

Another photo.

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: McCorquodale, Brenda
Sent: Thursday, June 21, 2018 8:00 AM
To: Paylor, Adrienne; Webb, Allison
Subject: Sea lice herring

This is going viral on Facebook - in case you have not seen.

"Thousands of herring covered in sea lice washing up in Hot Springs cove"

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

Kelly, Gerry

From: Ganton, Amy
Sent: 2018-June-22 11:03 AM
To: Kelly, Gerry; Goruk, Andrea; Rusch, Bryan; Hall, Peter; O'Connell, Ryan; Conley, Kevin; Preston, Paul; Neuman, Amber; Spence, Brenda; Postlethwaite, Victoria
Cc: Brown, Laura (Pacific); Spence, Michael; Cleary, Jaclyn
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Attachments: Herring Morts with Sea Lice HSC 2.jpg; Herring Morts with Sea Lice HSC 3.jpg; Herring Morts with Sea Lice HSC 4.jpg; Herring Morts with Sea Lice HSC.jpg; Juvenile salmon covered in sea lice.jpg

Importance: High

Hi folks,

'Casting a net' to the DFO web...do you know who we contact for these kinds of issues/contact info [REDACTED] also gave the heads up that there will likely be some negative social media from this event.

Thanks,
Amy

From: [REDACTED]
Sent: June-22-18 10:55 AM
To: Ganton, Amy
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi Amy

Who would else would be the contact for something like this. The issue of a sea lice outbreak in Clayquot Sound was brought up at the COHFOF meeting last week and Laura Brown said she would find out. I tried calling her, but she is not available.

From: [REDACTED]
Sent: June-21-18 5:24 PM
To: Jaclyn.Cleary@dfo-mpo.gc.ca
Cc: [REDACTED]
Subject: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

s.19(1)

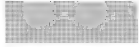
Hi Jaclyn,

[REDACTED] called me yesterday to report hundreds of juvenile herring dying in Hot Springs Cove that are covered with sea lice. The photo he originally sent me is "herring morts with sea lice HSC" that has the 3 samples he collected. I went up there today to collect samples with [REDACTED] the Cedarcoast Research station. We collected 22 samples of partially dead and dead herring floating on the surface that were absolutely littered with sea lice. We also collected some water samples along with checking temperature, DO, and salinity with his YSI. There is a sea lice epidemic occurring at some Cermaq fish farm sites that we have documented spreading to the wild salmon. (Juvenile Salmon photo). For example, [REDACTED] beach seining of juveniles around Vargas found salmon smolts with over 30 lice attached and even one coho smolt with over 50. The one fish farm found in Ross Passage has an average of 34

adult sea lice per fish!!! These levels of sea lice are unprecedented and is extremely disconcerting now that we see it's impacting WCVI herring.

We are wondering if you would like these samples or know of someone we should send them to within the department.

Sincerely,



Uu-a-thluk Fisheries, Nuu-chah-nulth Tribal Council

P: 250-725-3899 | C: [REDACTED]

TF: 1-844-725-3899

PO BOX 1108, Tofino, BC V0R 2Z0



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s.19(1)











Kelly, Gerry

From: Robson, Jim
Sent: 2018-June-22 11:47 AM
To: Kelly, Gerry
Subject: FW: herring die-off lines

info

From: Rainer, Michelle
Sent: Friday, June 22, 2018 11:45 AM
To: Higgins, Mark; Robson, Jim
Cc: Doucette, Claire
Subject: RE: herring die-off lines

Hi Jim,
Mark is available to speak to the FN about this; I'll leave the two of you to coordinate.
Thanks,
Michelle

From: Rainer, Michelle
Sent: June-22-18 11:40 AM
To: Doucette, Claire; Robson, Jim
Subject: herring die-off lines

Hi Jim,
I understand you are looking for someone to speak to Nuu-chal-nuth about this; I will contact science to see who is available.
Regards,
Michelle

Issue: Reports and photos of dead herring infested with sea lice in the Hot Springs Cove area near Tofino are being shared on Facebook, with claims that the event is linked to salmon farming:
https://www.facebook.com/zoceanfox?hc_ref=ARQY9qmSvyzCa8619RpZVtAj0lvD3YzpNX8t8k1b-clC4wiqOL5hq3xLBtFO0ACuNBI&fref=nf&hc_location=group Media inquiries may follow.

Deadline: Anticipatory

Recommendation: Email response. Science spokes not available today.

Approved by: Simon Jones, Mark Higgins, Carmel Lowe

Media lines:

- Herring die-offs are not unusual at this time of year as the weather warms up and ocean temperatures rise, creating ideal conditions for viral diseases and algae blooms.
- Sea lice are a naturally occurring ocean parasite that affect many species of fish, including herring. Sea lice do not generally cause mortality in herring.
- Fisheries and Oceans Canada (DFO) staff will visit the site and collect samples that will be used to study the cause of this mortality event.

Kelly, Gerry

From: Cleary, Jaclyn
Sent: 2018-June-22 11:50 AM
To: Kelly, Gerry
Subject: Fwd. Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

FYI, my actions on science-front thus far.

I was also contacted by Media but declined as this is not my area...

Jaclyn Cleary

Program Head- Pacific Herring
Quantitative Assessment Methods Section (QAMS)
Stock Assessment and Research Division, Science
Fisheries and Oceans Canada, Government of Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tel: 250-756-7321

Section de méthod d'évaluation quantitatif (SMEQ)
Division de l'évaluation des stocks et de la recherche, Science
Pêches et océans Canada, Gouvernement du Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tél. 250-756-7321

Begin forwarded message:

From: Jaclyn Cleary <Jaclyn.Cleary@dfo-mpo.gc.ca>
Subject: Fwd: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Date: June 22, 2018 at 11:46:32 AM PDT
To: Kyle P Hebert <kyle.hebert@alaska.gov>, Simon Jones <Simon.Jones@dfo-mpo.gc.ca>
Cc: Nathan Taylor <Nathan.Taylor@dfo-mpo.gc.ca>, John Holmes <John.Holmes@dfo-mpo.gc.ca>, Robyn Forrest <Robyn.Forrest@dfo-mpo.gc.ca>

Simon, Kyle,

One of our First Nations collaborators has collected some samples of herring with sea lice. Is there a way to identify whether these lice are from neighbouring salmon farms (see thread below). I've committed to sending a more thorough response and I'm needing some direction from one/ both of you.

Thanks,
Jaclyn

Jaclyn Cleary

Program Head- Pacific Herring
Quantitative Assessment Methods Section (QAMS)
Stock Assessment and Research Division, Science
Fisheries and Oceans Canada, Government of Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tel: 250-756-7321

Section de méthod d'évaluation quantitatif (SMEQ)
Division de l'évaluation des stocks et de la recherche, Science
Pêches et océans Canada, Gouvernement du Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tél: 250-756-7321

Begin forwarded message:

From: Jaclyn Cleary <Jaclyn.Cleary@dfo-mpo.gc.ca>

Subject: Re: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice

Date: June 22, 2018 at 11:41:45 AM PDT

To: [REDACTED]

Cc: [REDACTED]

[REDACTED] Matthew Thompson <Matthew.Thompson@dfo-mpo.gc.ca>

Hi [REDACTED]

I've sent some inquiries within my department and will get back to you with a more thorough response. Please label the samples (location, date, time, sample method) and keep frozen.

~Jaclyn

Jaclyn Cleary

Program Head- Pacific Herring
Quantitative Assessment Methods Section (QAMS)
Stock Assessment and Research Division, Science
Fisheries and Oceans Canada, Government of Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tel. 250-756-7321

Section de méthod d'évaluation quantitatif (SMEQ)
Division de l'évaluation des stocks et de la recherche, Science
Pêches et océans Canada, Gouvernement du Canada
Email: Jaclyn.Cleary@dfo-mpo.gc.ca / Tél: 250-756-7321

On Jun 21, 2018, at 5:23 PM, [REDACTED] wrote:

Hi Jaclyn,

[REDACTED] called me yesterday to report hundreds of juvenile herring dying in Hot Springs Cove that are covered with sea lice. The photo he originally sent me is "herring morts with sea lice HSC" that has the 3 samples he collected. I went up there today to collect samples with [REDACTED] the Cedarcoast Research station. We collected 22 samples of partially dead and dead herring floating on the surface that were absolutely littered with sea lice. We also collected some water samples along with checking temperature, DO, and salinity with his YSI. There is a sea lice epidemic occurring at some Cermaq fish farm sites that we have documented spreading to the wild salmon. (Juvenile Salmon photo). For example, [REDACTED] beach seining of juveniles around Vargas found salmon smolts with over 30 lice attached and even one coho smolt with over 50. The one fish farm found in Ross Passage has an average of 34 adult sea lice per fish!!! These levels of sea lice are unprecedented and is extremely disconcerting now that we see it's impacting WCVI herring.

s.19(1)

We are wondering if you would like these samples or know of someone we should send them to within the department.


Sincerely,



<image005.jpg>



Uu-a-thluk Fisheries, Nuu-chah-nulth Tribal Council

P: 250-725-3899 | C: 

TF: 1-844-725-3899

PO BOX 1108, Tofino, BC V0R 2Z0

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<Herring Morts with Sea Lice HSC 2.jpg><Herring Morts with Sea Lice HSC 3.jpg><Herring Morts with Sea Lice HSC 4.jpg><Herring Morts with Sea Lice HSC.jpg><Juvenile salmon covered in sea lice.jpg>

s.19(1)

Kelly, Gerry

From: Kelly, Gerry
Sent: 2018-June-22 11:57 AM
To: Ganton, Amy; Goruk, Andrea; Rusch, Bryan; Hall, Peter; O'Connell, Ryan; Conley, Kevin; Preston, Paul; Neuman, Amber; Spence, Brenda; Postlethwaite, Victoria
Cc: Brown, Laura (Pacific); Spence, Michael; Cleary, Jaclyn
Subject: RE: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice

Hello again.

I will work in consultation with RM and Communications to craft a response – thank you for this heads up.

Don't hesitate to call if you need further information ([REDACTED])

Gerry

From: Ganton, Amy
Sent: 2018-June-22 11:03 AM
To: Kelly, Gerry; Goruk, Andrea; Rusch, Bryan; Hall, Peter; O'Connell, Ryan; Conley, Kevin; Preston, Paul; Neuman, Amber; Spence, Brenda; Postlethwaite, Victoria
Cc: Brown, Laura (Pacific); Spence, Michael; Cleary, Jaclyn
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi folks,

'Casting a net' to the DFO web...do you know who we contact for these kinds of issues/contact info [REDACTED] also gave the heads up that there will likely be some negative social media from this event.

Thanks,

Amy

From: [REDACTED]
Sent: June-22-18 10:55 AM
To: Ganton, Amy
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi Amy

Who would else would be the contact for something like this. The issue of a sea lice outbreak in Clayquot Sound was brought up at the COHFOF meeting last week and Laura Brown said she would find out. I tried calling her, but she is not available.

From: [REDACTED]
Sent: June-21-18 5:24 PM
To: Jaclyn.Cleary@dfo-mpo.gc.ca
Cc: [REDACTED]
Subject: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi Jaclyn,

s.16(2)(c)

s.19(1)

[REDACTED] called me yesterday to report hundreds of juvenile herring dying in Hot Springs Cove that are covered with sea lice. The photo he originally sent me is "herring morts with sea lice HSC" that has the 3 samples he collected. I went up there today to collect samples with [REDACTED] the Cedarcoast Research station. We collected 22 samples of partially dead and dead herring floating on the surface that were absolutely littered with sea lice. We also collected some water samples along with checking temperature, DO, and salinity with his YSI. There is a sea lice epidemic occurring at some Cermaq fish farm sites that we have documented spreading to the wild salmon. (Juvenile Salmon photo). For example, [REDACTED] beach seining of juveniles around Vargas found salmon smolts with over 30 lice attached and even one coho smolt with over 50. The one fish farm found in Ross Passage has an average of 34 adult sea lice per fish!!! These levels of sea lice are unprecedented and is extremely disconcerting now that we see it's impacting WCVI herring.

We are wondering if you would like these samples or know of someone we should send them to within the department.

Sincerely,

[REDACTED]



[REDACTED]
Uu-a-thluk Fisheries, Nuuchah-nulth Tribal Council

P: 250-725-3899 | C: [REDACTED]

TF: 1-844-725-3899

PO BOX 1108, Tofino, BC V0R 2Z0

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s.19(1)

Kelly, Gerry

From: Kelly, Gerry
Sent: 2018-June-22 12:11 PM
To: Ganton, Amy; Goruk, Andrea; Rusch, Bryan; Hall, Peter; O'Connell, Ryan; Conley, Kevin; Preston, Paul; Neuman, Amber; Spence, Brenda; Postlethwaite, Victoria
Cc: Brown, Laura (Pacific); Spence, Michael; Cleary, Jaclyn; Robson, Jim
Subject: RE: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice

My understanding is that Mark Higgins, PBS Fish Health is going to call [REDACTED]
We will see how that unfolds and go from there.
Thank you
Gerry

From: Ganton, Amy
Sent: 2018-June-22 11:03 AM
To: Kelly, Gerry; Goruk, Andrea; Rusch, Bryan; Hall, Peter; O'Connell, Ryan; Conley, Kevin; Preston, Paul; Neuman, Amber; Spence, Brenda; Postlethwaite, Victoria
Cc: Brown, Laura (Pacific); Spence, Michael; Cleary, Jaclyn
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi folks,

'Casting a net' to the DFO web...do you know who we contact for these kinds of issues/contact info [REDACTED] also gave the heads up that there will likely be some negative social media from this event.

Thanks,
Amy

From: [REDACTED]
Sent: June-22-18 10:55 AM
To: Ganton, Amy
Subject: FW: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi Amy
Who would else would be the contact for something like this. The issue of a sea lice outbreak in Clayquot Sound was brought up at the COHFoF meeting last week and Laura Brown said she would find out. I tried calling her, but she is not available.

From: [REDACTED]
Sent: June-21-18 5:24 PM
To: Jaclyn.Cleary@dfo-mpo.gc.ca
Cc: [REDACTED]
Subject: Juvenile Herring Dying in Hot Springs Cove covered with Sea Lice
Importance: High

Hi Jaclyn,

s.19(1)

██████████ called me yesterday to report hundreds of juvenile herring dying in Hot Springs Cove that are covered with sea lice. The photo he originally sent me is "herring morts with sea lice HSC" that has the 3 samples he collected. I went up there today to collect samples with I ██████████ the Cedarcoast Research station. We collected 22 samples of partially dead and dead herring floating on the surface that were absolutely littered with sea lice. We also collected some water samples along with checking temperature, DO, and salinity with his YSI. There is a sea lice epidemic occurring at some Cermaq fish farm sites that we have documented spreading to the wild salmon. (Juvenile Salmon photo). For example, ██████████ beach seining of juveniles around Vargas found salmon smolts with over 30 lice attached and even one coho smolt with over 50. The one fish farm found in Ross Passage has an average of 34 adult sea lice per fish!!! These levels of sea lice are unprecedented and is extremely disconcerting now that we see it's impacting WCVI herring.

We are wondering if you would like these samples or know of someone we should send them to within the department.

Sincerely,

██████████



██████████
Uu-a-thluk Fisheries, Nuuchahnulth Tribal Council

P: 250-725-3899 | C: ██████████

TF: 1-844-725-3899

PO BOX 1108, Tofino, BC V0R 2Z0

Uu-a-thluk
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s.19(1)

Kelly, Gerry

From: Robson, Jim
Sent: 2018-June-22 12:55 PM
To: Kelly, Gerry
Subject: FW: Sea lice epidemic - update

Jim Robson,

From: [REDACTED]
Sent: Friday, June 22, 2018 12:47 PM
To: [REDACTED]
Cc: Robson, Jim; Higgins, Mark; Cleary, Jaclyn
Subject: RE: Sea lice epidemic - update

Jim Robson got Mark Higgins from the Animal Health Unit at PBS to call me. [REDACTED] is going to take the samples to the lab on Monday as he will be in Nanaimo to bring back the Zodiac from repairs. Thanks Mark and Jim for helping us with this.

From: [REDACTED]
Sent: June-22-18 11:30 AM
To: [REDACTED]
Subject: RE: Sea lice epidemic

Jim Robson just called back. Aquaculture has no file on this as yet (but C&P have filed occurrence reports). I sent Jim the pictures of the infected herring and juvenile salmon [REDACTED] sent yesterday and he is going to send them up the line.

From: [REDACTED]
Sent: June-22-18 11:07 AM
To: [REDACTED]
Subject: RE: Sea lice epidemic

I just talked to Jim Robson (C&P). C&P Marine Protection Patrol (MPP) were the people who met [REDACTED] They took some samples and reported them to PBS. Jim does not know what PBS is doing or planning to do about them. He is going to call the Chief of Aquaculture and find out what is going on and call me back

From: [REDACTED]
Sent: June-22-18 11:02 AM
To: [REDACTED]
Subject: RE: Sea lice epidemic

[REDACTED] Cedarcoast Field Station brought a cooler with ice and we iced the samples right away. He took them to count sea lice and identify life history stage as he has experience doing so. I believe all the lice we found, without closely looking at them, were *Caligus* spp. As soon as we plucked them from the water and placed them onto the cutting board on the stern of our boat the lice were jumping off. We took ones that fell off and placed them in whirl packs with each individual sample.

I can send the one's [REDACTED] collected to DFO and we can hold onto the others.

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From: [REDACTED]
Sent: June-22-18 10:57 AM
To: [REDACTED]
Subject: RE: Sea lice epidemic

Mike Ballard will know if you can't. I will try to reach him for advice.

I chatted with my friend [REDACTED] and she says to put any samples on ice so they can be used for genomics.

If you go with DFO they will control samples. The lice on the herring are *Caligus* spp. but be careful as *Leps* will fall off herring as they are not 'committed' as they are on salmon.

From: [REDACTED]
Sent: June-22-18 10:26 AM
To: [REDACTED]
Subject: RE: Sea lice epidemic

Getting the word out on the degree of sea lice infections on wild stock is important so try and get DFO out to see. I could not find any specific contact for reporting sea lice outbreaks, but I suggest get a hold of C&P, Aquaculture staff at Marine.Finfish.Aquaculture@dfo-mpo.gc.ca to see if a Fish Health Event has been sent. As has been noted in other e-mails, the issue with fish farms is complex within Nuu-chah-nulth Nations. It would be problematic at this stage for the NTC to issue a press release on the issue linking the event to any particular farm. We can support individual Nations with a press release of their own about the degree of infection etc. and DFO's response, when the information is put together.

From: [REDACTED]
Sent: June-21-18 6:16 PM
To: [REDACTED]
Subject: Sea lice epidemic

Hi everyone,

[REDACTED] thanks very much for heading out to Hot Springs Cove today to gather samples of the herring with sea lice. [REDACTED] showed me some pictures today at the Friendship Centre.

I realize there is a lot of sensitivity around wading into the aquaculture debate but I think we need to go public with this. As in a press release and an effort to get some media coverage. This is an opportunity to put pressure on Cermaq and others to be more accountable. I think we have a responsibility to do so.

Because this is such a sensitive issue I see this as a collective decision. I'm certainly not going to make it on my own. [REDACTED] I'll be on email and if there's consensus around the idea of developing a media strategy I'll make myself available for a phone call to do some planning.

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Chuu



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Kelly, Gerry

From: Rainer, Michelle
Sent: 2018-June-22 1:18 PM
To: Webb, Allison; Kelly, Gerry; Thomson, Andrew; Robson, Jim; Lowe, Carmel; Brown, Laura (Pacific); Conley, Kevin; Spence, Brenda; Goruk, Andrea
Cc: Paylor, Adrienne
Subject: RE: Sea Lice - salmon and herring fry morts on teh WCVI

Hi,
Just an update that staff went out to collect samples but weren't able to find any.

From: Webb, Allison
Sent: June-22-18 1:11 PM
To: Kelly, Gerry; Thomson, Andrew; Rainer, Michelle; Robson, Jim; Lowe, Carmel; Brown, Laura (Pacific); Conley, Kevin; Spence, Brenda; Goruk, Andrea
Cc: Paylor, Adrienne
Subject: RE: Sea Lice - salmon and herring fry morts on teh WCVI

Hi – I hope I'm not overstepping my authority here, but FYI, here are the latest media lines approved by Carmel Lowe and contact people. If staff have any specific questions related to salmon farms and sea lice or advisory processes, please contact me and/or my manager, Adrienne Paylor and we can arrange to speak to you or provide more information on that aspect of things.

Thanks,
Allison

From: Rainer, Michelle
Sent: Thursday, June 21, 2018 11:36
To: Lowe, Carmel
Cc: Webb, Allison; Dickie, Catherine
Subject: FW: For approval: Herring lice media lines

Hi Carmel,
For your approval, thanks. Allison FYI.
Michelle

Issue: Reports and photos of dead herring infested with sea lice in the Hot Springs Cove area near Tofino are being shared on Facebook, with claims that the event is linked to salmon farming:

https://www.facebook.com/zoceanfox?hc_ref=ARQY9qmSvyzCa8619RpZVtAj0lvD3YzpNX8t8k1b-clC4wiqOL5hq3xLBtFO0ACuNBI&fref=nf&hc_location=group Media inquiries may follow.

Deadline: Anticipatory

Recommendation: Email response. Science spokes not available today.

Approved by: Simon Jones, Mark Higgins

Media lines:

- Herring die-offs are not unusual at this time of year as the weather warms up and ocean temperatures rise, creating ideal conditions for diseases caused by viruses and algal blooms.

- Sea lice are a naturally occurring ocean parasite that affect many species of fish, including herring. Sea lice do not generally cause mortality in herring.
- Fisheries and Oceans Canada (DFO) staff will visit the site and collect samples that will be used to study the cause of this mortality event.

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Kelly, Gerry
Sent: 2018-June-22 12:11 PM
To: Thomson, Andrew; Webb, Allison; Rainer, Michelle; Robson, Jim; Lowe, Carmel; Brown, Laura (Pacific); Conley, Kevin; Spence, Brenda; Goruk, Andrea
Subject: Sea Lice - salmon and herring fry morts on teh WCVI

Good afternoon - I am acting for Laura Brown today.
I have attached emails from SCA staff regarding sea lice concerns.
The main thing NTC wanted was to have a contact in the Department.
Based on conversations I have had with Jim Robson, my understanding is that Mark Higgins from PBS is going to contact [REDACTED] the NTC.
I think this should address the concerns in the short term.

Thank you
Gerry

Gerry Kelly
Aboriginal Affairs Advisor, South Coast Area
Phone: 250-754-0208
Cell: [REDACTED]
E-mail: Gerry.kelly@dfo-mpo.gc.ca

s.16(2)(c)
s.19(1)

Kelly, Gerry

From: Hall, Peter
Sent: 2018-June-25 11:36 AM
To: Kelly, Gerry
Subject: FW: Herring and Sealice
Attachments: Herring and Sealice June21 2018.pdf

From: [REDACTED]
Sent: June-23-18 8:15 PM
To: [REDACTED]
Subject: Herring and Sealice

Hello all,

Please find attached a document provided by [REDACTED] Cermaq, regarding recent posts on Facebook about sea lice on herring in the Hot Springs Cove area.



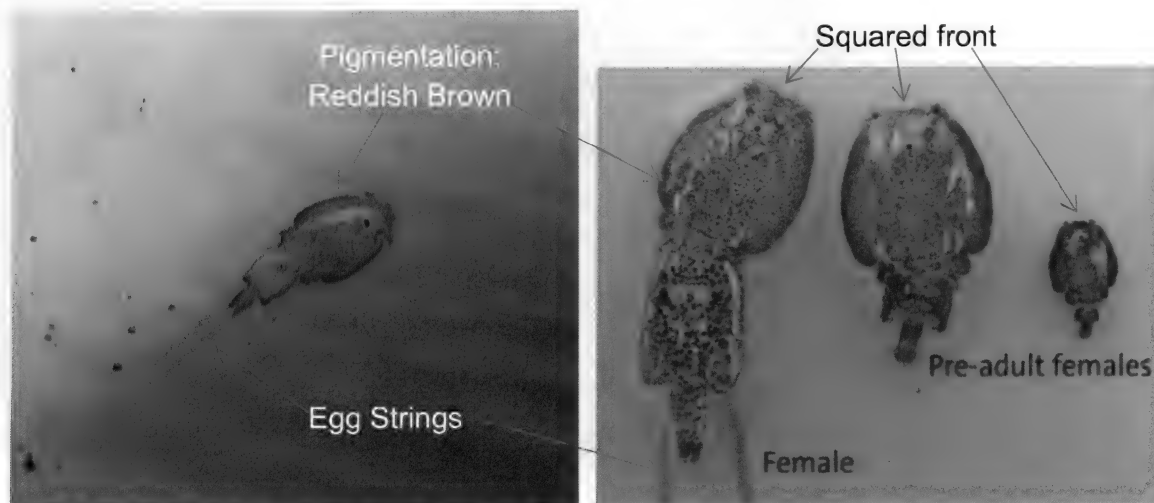
West Coast Aquatic
Cell [REDACTED]
www.westcoastaquatic.ca
www.roundtables.westcoastaquatic.ca
<https://marineguide.ca>

s.19(1)

21/06/2018

Cermaq Canada has seen the recent posts on social media (Facebook) regarding dead herring, covered in Sea Lice that are washing up on shore, in the Hot Springs Cove area.

Upon review of the photographs by both our fish health staff as well as 3rd party experts, these lice have been identified as *Caligus clemensi*, commonly known as the Herring Louse. This species of louse are a multi species louse and while they are observed on our own fish, (currently 0.23 per fish) they are not the larger salmon louse (*Lepeophtheirus salmonis*) that can cause problems for Salmon and are the species we are currently treating for at our farms in Tofino.



Caligus Sp.

Lepeophtheirus Salmonis

While one of the photos do show a single, heavily infested individual, the other images show lice numbers similar to what would normally be found on herring at this time of year. What cannot be determined from these images however, is what caused the herring to die, but lice is unlikely the cause, especially to cause a large mortality of 100's of fish in the same location, at the same time.

One possible explanation may be the result of elevated harmful plankton in the area that we have now been monitoring since early June and the current water conditions.

We have heard from some sources that there is talk that the recent Hydrogen Peroxide treatment currently being performed at our Bawden Pt facility, is the cause. This treatment is taking place 30km from the where this mortality has occurred and no mortality of wild fish has been observed anywhere in or near the treatment area.

cermaq.ca

Cermaq Canada Campbell River Office | #203-919 Island Hwy Campbell River, BC Canada V9W 2C2 | Tel: 250 286 0022 | Fax: 250 286 0042



McCorquodale, Brenda

From: [REDACTED]
Sent: Monday, June 25, 2018 3:40 PM
To: Ballard, Michael
Cc: Conley, Kevin; Spencer, Kent; Knight, Joe; McCorquodale, Brenda
Subject: RE: Sea lice epedemic in Calyqoquot Sound

Thanks Mike! Will pursue.

[REDACTED]

From: Ballard, Michael [<mailto:Michael.Ballard@dfo-mpo.gc.ca>]
Sent: June-25-18 2:37 PM
To: [REDACTED]
Cc: Conley, Kevin; Spencer, Kent; Knight, Joe; McCorquodale, Brenda
Subject: FW: Sea lice epedemic in Calyqoquot Sound

Hi [REDACTED]

Wish I could do more [REDACTED] I am also not in the position with AFS effective back on June 18th.

Kevin or Kent can hopefully direct your inquiry. I will also cc Joe Knight and Brenda McCorquodale as Joe is the CP lead for the operational enforcement group on aquaculture related issues and Brenda is the A/Aquaculture manager for the Environmental operations group who I believe is working out of Nanaimo.

Thanks for bringing this important information forward.

Regards,

Mike

From: [REDACTED]
Sent: Friday, June 22, 2018 2:01 PM
To: Ballard, Michael
Subject: Sea lice epedemic in Calyqoquot Sound

Who is DFO contact to document a current massive SLICE resistant Sea Lice outbreak in Clayoquot Sound?

It's on the juvenile herring in Hesquaiht Harbour too.

Sincerely,

[REDACTED]
Uu-a-thluk Fisheries Program
Nuu-chah-nulth Tribal Council
100 Ouwatin Road, Tsaxana
Gold River, BC, V0P 1G0
Ph: [REDACTED]
Cell: [REDACTED]

s.19(1)

Fx: 250-283-2122

E-address: [REDACTED]

s.19(1)

No further information has been removed or severed from this page

McCorquodale, Brenda

From: Conley, Kevin
Sent: Monday, June 25, 2018 2:39 PM
To: Ballard, Michael; [REDACTED]
Cc: Spencer, Kent; Knight, Joe; McCorquodale, Brenda
Subject: RE: Sea lice epedemic in Calyqoquot Sound

Hi Mike,

Thanks for including me. My understanding is that Mark Higgins from DFO contacted [REDACTED] on this.

[REDACTED] I hope that covered it, feel free to contact me further.

Cheers,
Kevin

From: Ballard, Michael
Sent: June-25-18 2:37 PM
To: [REDACTED]
Cc: Conley, Kevin; Spencer, Kent; Knight, Joe; McCorquodale, Brenda
Subject: FW: Sea lice epedemic in Calyqoquot Sound

Hi [REDACTED]

Wish I could do more [REDACTED] I am also not in the position with AFS effective back on June 18th.

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To: Ballard, Michael
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It's on the juvenile herring in Hesquaiht Harbour too.

Sincerely,

s.19(1)

[REDACTED]
Uu-a-thluk Fisheries Program

Nuu-chah-nulth Tribal Council

100 Ouwatin Road, Tsaxana

Gold River, BC, V0P 1G0

Ph: [REDACTED]

Cell: [REDACTED]

Fx: 250-283-2122

E-address: [REDACTED]

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Juvenile salmon and sealice monitoring in Clayoquot Sound

Introduction

This year we assessed the sea lice load and external health of Juvenile Salmon during a portion of their out-migration in Clayoquot Sound. Our focus was on the migration corridor from the Cypre river in Cypress harbour through Father Charles Channel and out to the Pacific Ocean. We took on this sampling program this year as certain farms in the region have been reporting their highest lice loads since the Department of Fisheries "Industry sea lice counts at BC marine finfish aquaculture sites" reporting system was established in 2011.

Background

Salmon-sealice-farm dynamic

Sealice are a naturally occurring ectoparasite on wild pacific salmon and other fishes. Sealice that impact both wild and farmed salmon are two species: *Lepeophtheirus salmonis*, a salmon specialist ectoparasite, and *Caligus clemensi*, a generalist fish ectoparasite.

Previous assessments in Clayoquot Sound

Two previous assessment of sealice on juvenile salmonids have been completed in Clayoquot Sound by The Clayoquot Sound Sea Lice Working Group and the Wild Fish Conservancy from 2004-2007 and 2009-2010 respectively.

The Clayoquot Sound Sea Lice Working Group operated a spatially intensive sampling regime during the 2004-2007 juvenile salmon out-migrations, visiting sites near the head of the Clayoquot Sound Inlets. Bedwell Sound, Tofino Inlet, and Fortune Channel were sampled each year from 2004 to 2007. The Working group reported prevalence values for all life-stages and species of sealice on wild juvenile Chum Salmon of 10% in 2004, 9% in 2005, 20% in 2006, and 7% in 2007. Chinook Salmon were reported to exhibited similar sea lice infestation prevalence's as Chum Salmon each year, but less Chinook Salmon were examined annually.

The Wild Fish Conservancy (WFC) completed a spatially intensive sampling regime during the 2009 and 2010 juvenile salmon out-migration in Clayoquot Sound. The WFC had sample sites ranging throughout the inlets in Clayoquot Sound from the mouth to head of the inlets and included control sites in Barkley Sound. We revisited a number of the sites established by the WFC for our 2018 assessment. The WFC reported an abundance of sealice on wild juvenile salmon of 0.42 (SE 0.078) and 0.36 (SE 0.067) in 2009 and 2010 respectively for the same time period and sample sites that we surveyed. The prevalence the WFC reported was 0.23 (SE 0.033) and 0.29 (SE 0.048) in 2009 and 2010 respectively.

Assessments in the Broughton Archipelago

The Broughton Archipelago has the highest density of salmon farms in British Columbia. The Salmon Coast Field Station Society has been conducting annual sealice and wild salmon fry surveys since 2001. This year in the Broughton Archipelago lice loads were reduced after three years of continuous high, they have been observing an overall prevalence (for all louse life-stages and species) of 0.29 and a mean lice abundance per fish of 0.404 (SE 0.043).

Recent farm outbreak

...

Our assessment

Methods

We surveyed 12 different sites in the Clayoquot Sound region of British Columbia from April 26 to June 23, 2018. These sites were originally sampled by the Wild Fish Conservancy in 2009 and 2010. We only captured fish at three of the 12 sample sites, these sites were Buckle Bay (E. Vargas Island), Elbow Bank (N. Vargas Island and the Cypre River (Cypress Bay). Sampling was done roughly once a week, or when conditions allowed. We sampled from mixed schools of juvenile Pacific Salmon using the beach seining method. The schools primarily consisted of Chum Salmon. Coho salmon were opportunistically sampled, as were two Pink Salmon and one Chinook Salmon. Using dipnets, juvenile salmon that were in the bunt of the sein net were placed in white buckets partially filled with seawater. All of the salmon were then transferred to a Ziploc® bag filled with sea water one at a time to measure length, height and be examined for lice and external signs of predation and disease. We collected temperature and salinity data from 0m and 1m after each successful beach seine.

Lice were identified to the species (*L. salmonis* and *C. clemensi*), life stage, and sex using a 16x magnification hand lens. The life stages of the lice were differentiated as copepodid, chalimus A, chalimus B, preadult, and adult. We were able to differentiate sex for preadult and adult *L. salmonis* and noted when females were gravid (had egg strings). We did not differentiate sex for *C. clemensi* motiles but noted when females were gravid. We were not able to differentiate the two species when they were in the chalimus A and chalimus B stage. For these stages, the counts of the two species are grouped. We noted chalimus or motile scars, predator strike scars, hemorrhaging, eroded gills, blue blotches, “pinched bellies”, the development of scales, presence of clouded eyes (potentially an indication of disease) and mate-guarding behaviour by male lice. All fish were returned to the water after being measured and examined.

Results

We found the mean abundance of sealice, at all lifestages, on wild juvenile salmon throughout our assessment was 8.04 (SE 1.30) lice per fish. The prevalence of lice on juvenile salmon throughout our assessment was 0.96 (SE 0.03). We observed seven fish without any signs of lice and we observed one fish with as many as 50 lice

Temperature and salinity at each

Discussion

There was a proposal to take management action in January 2018 using a hydrogen peroxide based treatment but this treatment was stalled until June 2018.

Figures

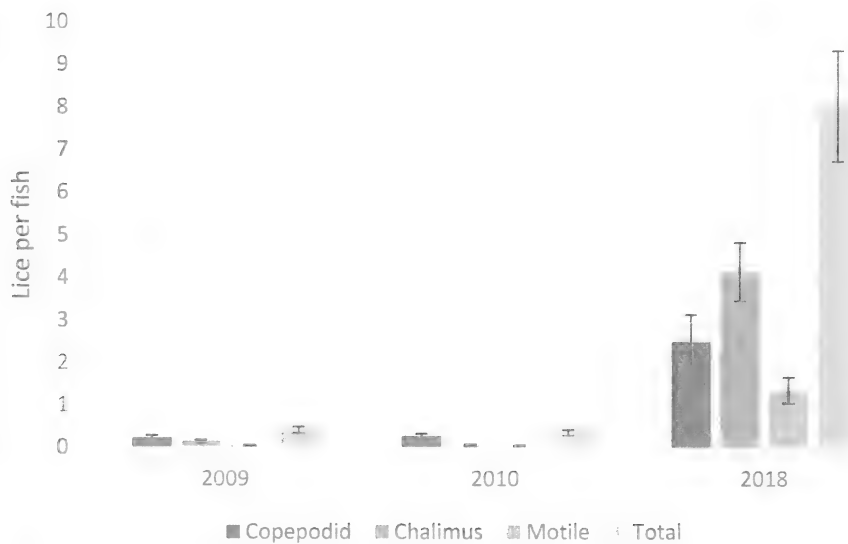


Figure xx. The mean amount (95% confidence intervals) of lice per fish at the copepodid, chalimus, and motile stages of both *L. salmonis*, and *C. clemensi* sea lice species. Displayed are the values gathered in 2009, 2010, and 2018 from Cypress Bay and Vargas Island from late April to June. Data from 2009 and 2010 was gathered by the Wild Fish Conservancy.

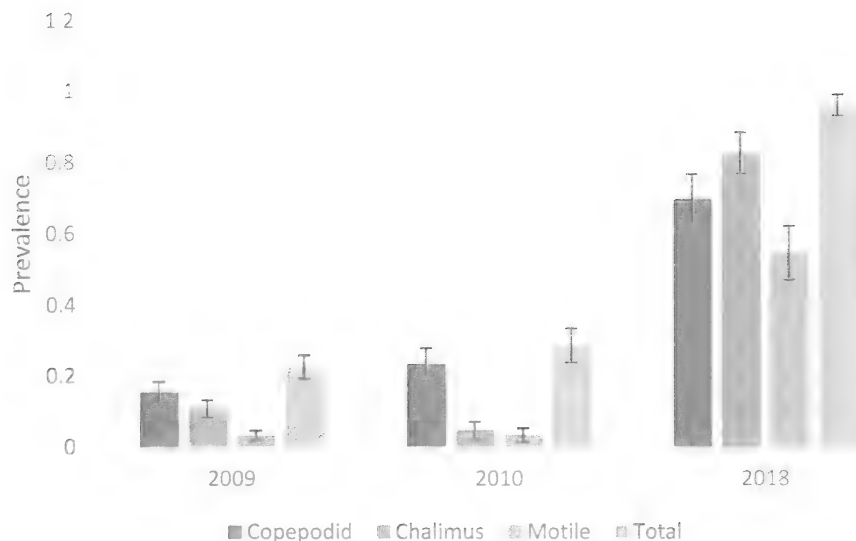


Figure xx. The proportion of the salmon examined that had at least one louse of either *L. salmonis*, or *C. clemensi* sea lice species, with 95% confidence intervals. Displayed are the values gathered in 2009, 2010, and 2018 from Cypress Bay and Vargas Island from late April to June. Data from 2009 and 2010 was gathered by the Wild Fish Conservancy.

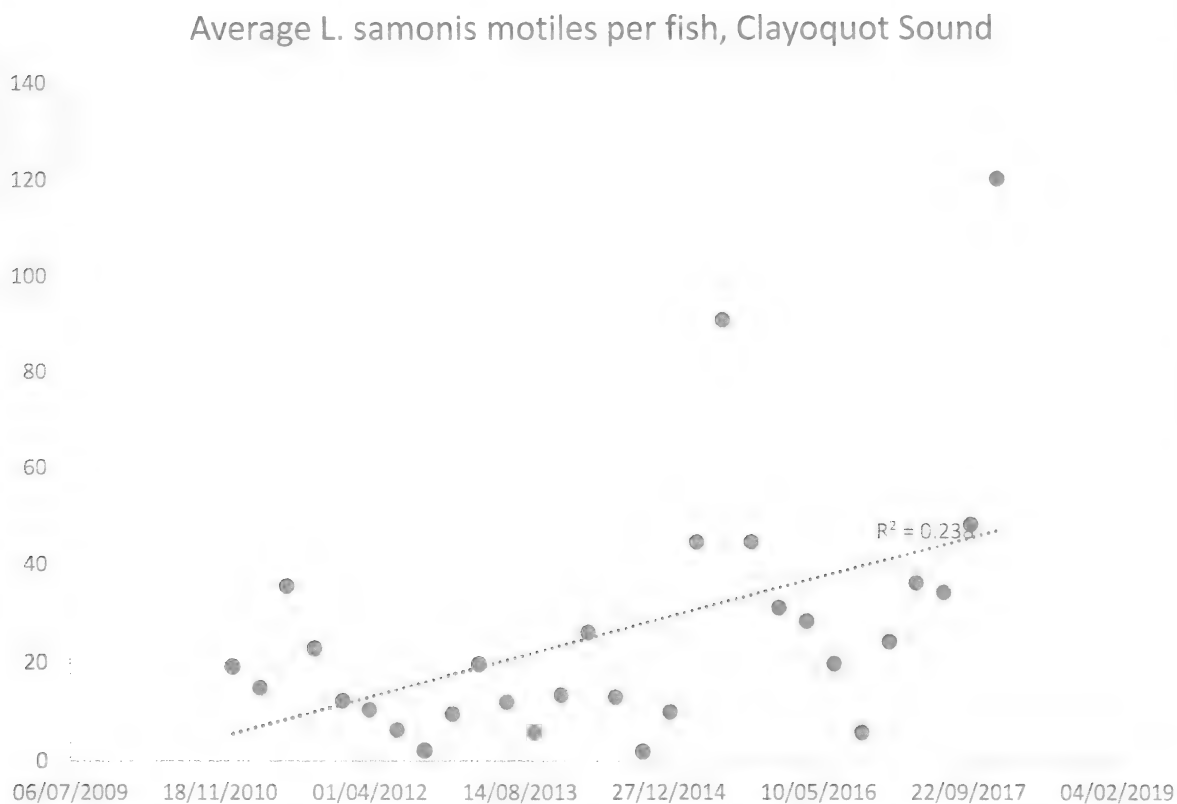


Figure xx average *L. salmonis* motile lice per fish on farmed Atlantic Salmon reported from salmon farm sealice counts completed on all farms located in the Clayoquot Sound region from 2011 to 2018. Data obtained from: <https://open.canada.ca/data/en/dataset/3cafbe89-c98b-4b44-88f1-594e8d28838d>

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Average Farm lice counts, all life-stages 2011-2018

120

100

80

60

40

20

0

0

10

20

30

40

50

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70

80

90

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150

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170

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190

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Delaney, Paula

From: Wilkinson, Davida
Sent: July-13-18 5:44 PM
To: Webb, Allison
Subject: MECTS-#3927857-v1-Sea_Lice_Management_Issue_in_Pacific_Region_-Memo-_June_2018.docx
Attachments: MECTS-#3927857-v1-Sea_Lice_Management_Issue_in_Pacific_Region_-Memo-_June_2018.docx

This is the only version.



Fisheries and Oceans Canada
Correspondence Routing Slip

Fiche d'acheminement de correspondance
Pêches et Océans Canada

UNCLASSIFIED
GCCMS #: 2018-502-00102
EKME #: 3927857

To: Catherine Blewett
Pour:

Date:

Object: **SEA LICE MANAGEMENT ISSUE IN PACIFIC REGION**
Objet:

From / De: Andrew Thomson, Regional Director, Fisheries Management

Via: Rebecca Reid, Regional Director General, Pacific Region

Additional approvals:
Autre(s) approbation(s):

☐

Material for the Minister
Documents pour le Ministre

☐

Your Signature
Votre signature

☒

Information

Screen: The Department has assessed this issue in full.
Filtre: ☒ It contains no reference to matters covered by the screen relating to J.D. Irving Limited.
☐ It contains matters referenced in the screen relating to J.D. Irving Limited, but in our view does not engage the screen.
☐ In our view, the screen relating to J.D. Irving Limited should be engaged.

Remarks: This briefing note was developed in consultation with the following
Remarques: regions/sectors:

Distribution:

Drafting Officer/
Rédacteur:

Adrienne Paylor (250)-286-5817/ Allison Webb / pd



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Pacific Region

Région du Pacifique

Regional Director General

Directrice générale régionale

UNCLASSIFIED
2018-502-00102
EKME #: 3927857

MEMORANDUM FOR THE DEPUTY MINISTER

**SEA LICE MANAGEMENT ISSUE IN PACIFIC REGION
(FOR INFORMATION)**

SUMMARY OF ADVICE TO DEPUTY MINISTER

The purpose of this note is to bring to your attention a growing pattern of sea lice management challenges in British Columbia.

Within the last three years the department has become aware of elevated sea lice levels for a variety of sites in Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot Sound in 2018. Currently management approaches have not been effective to reduce the lice loads.

This situation has raised media attention and public concern over potential harm to salmon smolts during out migration periods. The Department is planning to take action to address the shortcomings of sea lice management approaches in the Pacific Region.

Immediate next steps include internal discussions [REDACTED] and continued collaboration with [REDACTED] Communications to respond to media and public inquiries should they arise.

Medium to long term actions will include consultation with Science Branch, Industry, British Columbia and potentially others such as First Nations on improved Integrated Pest Management approaches and potential changes to condition of licence.

s.21(1)(b)
s.23

BACKGROUND

Numerous Salmon farms in Clayoquot Sound, operated by Cermaq on the West Coast of Vancouver Island, are experiencing extremely high sea lice counts (80 to 100 lice per fish) this spring. When lice levels cannot be managed there is a risk of spillover of farmed lice onto migrating smolts increasing the risk of detrimental effects to wild fish.

.../2

At present, there are few options available to the aquaculture industry to reduce the sea lice loads below the DFO threshold. Until recently, the only drug available has been emamectin benzoate known as SLICE. Area based SLICE treatments conducted in September and early October 2017 in Clayoquot had much lower effect than expected and resulted in lice numbers remaining high into 2018. Aquaculture Management staff have collected sea lice samples from one of the 7 sites over regulatory thresholds and have confirmed SLICE resistance.

Alternative treatment was pursued by Cermaq however their application which requires approval by the BC Ministry of Environment for the use of hydrogen peroxide (Paramove) was delayed by public opposition/consultation in Tofino. As a result their only management option remaining was harvest.

Accelerated harvest is challenged by capacity at processing plants and harvest vessels limiting its effectiveness as a management tool. In the case of Clayoquot in 2018, there were also demands for harvesting efforts to be redirected other farms to ensure they remained below the maximum tonnage of fish allowed on the farm according to conditions of licence (CoL). Failure to harvest on an accelerated timeline increases the risk to wild outmigrating salmon smolts and may represent non-compliance with CoL.



STRATEGIC CONSIDERATIONS

This situation has highlighted the shortcomings of “harvest” as a management tool since harvest capacity at processing plants and harvest vessels is fixed and companies try to ensure they maintain peak efficiencies; therefore there is generally not additional capacity to allow harvesting as a management tool. This limitation has been encountered with all three major salmon farming companies, in three of the past four outmigration periods.

DFO Aquaculture Management is considering different options such as mandatory fallowing as well as further research into the thresholds used for regulatory management of sea lice.



Industry is aware of this situation and generally supportive of considering alternative management approaches. In this current situation, Cermaq has voluntarily withdrawn their Aquaculture Stewardship Certification in recognition of this issue.

s.21(1)(a)

s.21(1)(b)

s.23

Any options will require consultation with First Nations as well as industry and BC.

There was initial media interest in this issue in Clayoquot Sound, but this has subsided. Aquaculture Management will work with Communications as any changes are contemplated.

SCIENCE ADVICE

DFO Aquaculture will consider whether more research is necessary
and work with Science as appropriate.

INTERDEPARTMENTAL CONSULTATIONS

N/A

INDIGENOUS CONSULTATIONS

Once options are identified, DFO will consider the most appropriate approach to consultations with First Nations.

EXTERNAL CONSULTATIONS

Aquaculture Management plans to engage with industry and BC through our advisory process to highlight the need for an improved approach to management going forward.

ADVICE AND RECOMMENDATIONS TO DEPUTY MINISTER

Further briefings will be forthcoming when options are developed.

Rebecca Reid
Regional Director General

s.21(1)(b)

s.23

Luedke, Wilf

From: [REDACTED]
Sent: July-23-18 12:50 PM
To: Miller-Saunders, Kristi
Cc: Luedke, Wilf
Subject: Re: Clayoquot marine sampling

Hi Kristi,

Thank you for the update. Ah that is good to know that the SSHI is wrapping up. If there is any way we can support your future work please let me know.

All the best,



On Mon, 23 Jul 2018 at 12:26, Miller-Saunders, Kristi <Kristi.Saunders@dfo-mpo.gc.ca> wrote:

The samples have not been run yet but are slated to be. Will get back to you once we have results. Just an FYI, we are, at present, no longer funded to run infectious agent monitoring as our SSHI funding is now over. We are hoping to apply for funding to continue with this research on the west coast of Vancouver Island in the coming year.

Thanks,

Kristi

From: [REDACTED]
Sent: July-23-18 10:27 AM
To: Luedke, Wilf
Cc: Miller-Saunders, Kristi
Subject: Re: Clayoquot marine sampling

Hi Wilf and Kristi,

I just wanted to follow up and see how the meeting went [REDACTED] Has their been more discussion of a sampling program for next year?

Kristi, I was also wondering if there was any findings from the coho smolts and herring that we collected [REDACTED] at the end of June?

s.19(1)

Some of the herring samples were also sent to the aquatic animal health lab and it was reported 22 of the 26 samples had VHSV (genotype IVa).

Regards,

On Wed, 27 Jun 2018 at 16:08, [REDACTED] wrote:

Hi Wilf,

I have not had time to finish up our report and analysis of our preliminary Clayoquot sealice data but I have attached an excel file with the Clayoquot sealice data which includes a page with juvenile salmon and a page of juvenile herring which were washing up in Hotsprings cove covered in Caligus lice (samples have since been sent to kristi's lab and to Jacklyn Cleary).

I have also included the beginnings of our report with some graphs and a bit of simple analysis.

I have been speaking [REDACTED] quit a bit about sealice in Clayoquot Sound and I know he has been doing a bit of research on the farm sea lice loads. I have also been sharing this data with him so he is aware of our findings so far.

I hope the meeting goes well,

All the best,

[REDACTED]
s.19(1)

On Mon, 18 Jun 2018 at 14:12, [REDACTED] wrote:

Hi Wilf and Kristi,

I am glad to hear you have arranged a meeting [REDACTED] I am just working on our preliminary report right now for the small amount of sampling we did do this year. I have also been looking through the data from the wild fish conservancy (2009-2010 assessment, the NTC assessment done in 2004-2007 and the public farm data from 2011 onward. If it would be of help for me to provide some background from the previous assessments please let me know.

Kristi, Thank you for that information, I did not realize it was the province that was collecting on-farm lice data prior to 2011. I found [REDACTED] listed with Sakana veterinary services in Campbell River and his profile mentions working with [REDACTED] I could try and reach out to him about the compiled data from before 2011.

Regards,

[REDACTED]

On Mon, 18 Jun 2018 at 08:55, Luedke, Wilf <Wilf.Luedke@dfo-mpo.gc.ca> wrote:

Thanks [REDACTED] Kristi and I are meeting with Ahousaht and TFN later this month to discuss assessment of juvenile salmon in Clayoquot, eDNA, etc. So your input would be valuable. Our contacts [REDACTED] Perhaps we can start then quickly bring you into the planning. Anything you can provide before June 26 would be useful in these discussions.

Wilf

s.19(1)

Wilf Luedke

Chief Biologist, South Coast Area Stock Assessment

Fisheries and Oceans Canada

Nanaimo, BC

Office: 250-756-7222

Cell: [REDACTED]

From: [REDACTED]

Sent: June-14-18 9:14 PM

To: Luedke, Wilf

Subject: Re: Clayoquot marine sampling

Hi Wilf,

It was great meeting you as well. We are just decompressing from our current season and are beginning to plan for next year so we have not really formalized anything yet. In broad strokes the idea is to monitor the out-migration of juvenile chum and chinook salmon with an emphasis on Chinook since they are mostly the ocean-type here as you were mentioning. We would likely be doing beach seining and live-assessments but we have the licence and potential to do lethal sampling for viral, lice and genetic work etc. We also have the potential to be doing water sampling for viruses and other pathogens, I have a colleague who has been doing this in part through Kristi Millers Lab over the past couple years. I would be keen to discuss funding options, analyzing existing data and collaborating moving forward. One stumbling block I have had was finding access to farm lice load data prior to 2011, there is an open-gov site with the up to date farm lice data from 2011 onward but nothing before that. I have a meeting with another colleague tomorrow to discuss next years sampling so I can perhaps give you a more informed idea of our plan after that.

Hope to speak with you soon,

All the best,

s.16(2)(c)

s.19(1)

[REDACTED]

On Wed, 13 Jun 2018 at 16:00, Luedke, Wilf <Wilf.Luedke@dfo-mpo.gc.ca> wrote:

Hi [REDACTED] It was good to meet you. It would be good to understand your plan and how we can support or push a comprehensive plan for gathering together existing data along with your studies, and where to find funding. The PSC funding call is in August for next year's work. Let's talk soon.

Wilf

Chief Biologist

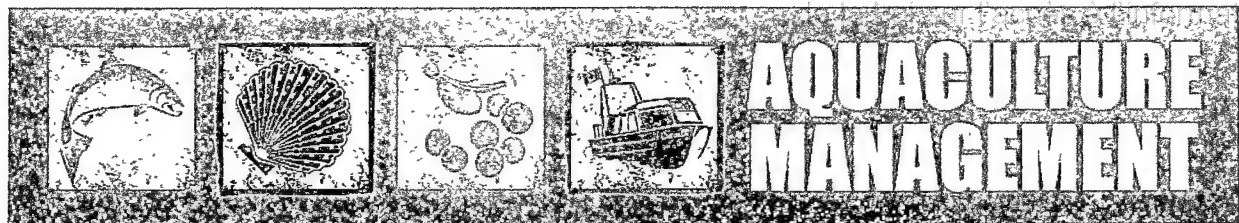
South Coast Stock Assessment

DFO Nanaimo

Mobile: [REDACTED]

Office: 250-756-7222

s.16(2)(c)
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**FISHERIES AND OCEANS CANADA (DFO)
FINFISH AQUACULTURE INDUSTRY ADVISORY PANEL (FAIAP)
MEETING SUMMARY (DRAFT)**

Meeting Date:	July 31, 2018, 9:00 am – 12:00 pm	
Location:	DFO Regional Headquarters, 401 Burrard St, Vancouver BC Conference Call#: 1-877-413-4781 / Passcode: [REDACTED]	
MEETING OBJECTIVES:	<ul style="list-style-type: none">• Provide updates on the BC Aquaculture Regulatory Program• Discuss and seek feedback from committee members on initiatives and issues	
Materials Distributed:	<ul style="list-style-type: none">• July 31, 2018 FAIAP Meeting Agenda• July 31, 2018 FAIAP Action Items• Draft May 2, 2018 FAIAP Meeting Summary• Status of Marine Finfish Harmonized Aquaculture Applications	
Attendees		
Industry	DFO	Province of BC
[REDACTED]	Allison Webb Lauren Lavigne Bernie Taekema Shelley Meadows Brenda McCorquodale Zac Waddington	Lesley Fettes

1. Welcome, Introductions, and Overview of the Agenda (A. Webb)

- A. Webb noted the new Minister (Jonathan Wilkinson) and briefings occurring in Vancouver this week.

2. Review of Action Items from May 2, 2018 FAIAP Meeting (A. Webb)

- DFO and industry provided updates on the status of their respective action items (refer to attached action items list).

-Short discussion on biosecurity and recent/expected court rulings. If court rules in favor of the fish farm companies industry suggested that DFO or the province imbed biosecurity regulations in legislation.

-It was noted that a constructive meeting hosted by MOE with industry and DFO regarding fish processing plan effluent occurred and further follow up meetings are expected to modernize the permit process.

s.16(2)(c)

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- **ACTION ITEM:** DFO to follow-up with MOE with regard to pathogen management at fish processing plants and associated permit requirements.
- The meeting agenda was reviewed and accepted as distributed. Minutes of the May 2, 2018 meeting were also approved.

Federal Update - (L. Lavigne)

- As of August 27th, 2018, L. Lavigne will be leaving on an assignment. An update on her replacement will be provided shortly.
- DFO is currently running a staffing process to create a pool of qualified Aquatic Health Veterinarians. Candidates will be interviewed and the goal is to have a new veterinarian in place by September.
- DFO is also working toward creating a position to establish epidemiological expertise within the Fish Health Audit and Surveillance Program (FHASP).
- DFO suggested updating the standards for circulating meeting minutes/action items as follows:
 - Minutes circulated to industry within two weeks;
 - Call for agenda items five weeks prior to next meeting – one week for a response;
 - Draft agenda circulated to FAIAP membership along with meeting invite four weeks prior to next meeting;
 - Agenda and attachments sent to committee members two weeks prior to meeting.

3. Aquaculture Program Updates

Applications: Status and number of current applications (B. Taekema)

- DFO circulated an updated spreadsheet to reflect the status of current aquaculture applications under review and provided a brief summary of the status of each application.
- Industry questioned how sites will be impacted by BC's new policy post-2022, as well as in the interim, particularly with regard to Federal licence amendments.

Strategic Working Group (SWG) updates (L. Lavigne)

- SWG met on May 4 and July 26, 2018. The SWG is working to further define the use of performance based standards as well as options for enhancing indigenous participation in aquaculture activities.
- DFO has requested that industry provide a list of First Nation representatives involved in aquaculture activities who could participate in upcoming joint SWG and FNFC Aquaculture Coordinating Committee Meeting (ACC) in September.
ACTION ITEM: Industry to provide list of First Nation representatives.
- Performance based metrics: DFO is looking at developing an approach related to fish health (i.e. sea lice, mortality) and subsequently expand to other aspects (related to Precautionary Approach – see below).
ACTION ITEM: The SWG will set up a meeting with departmental and industry

fish health representatives to scope out a proposal that will be presented to FAIAP.

- Precautionary approach: Recent audits have suggested that DFO does not clearly explain how the precautionary approach is being considered when making decisions. It is important to be able to explain this to respond to these external recommendations and increase public confidence in the robustness of the regulation of the industry. DFO is currently drafting documents to explain how the precautionary approach is used and the performance based metrics being developed by the Strategic Working Group for fish health will be included as part of this framework.
 - An example of the precautionary approach DFO takes is the sea lice threshold in licence conditions that are designed to minimize sea lice loading at farms during the wild salmon smolt out-migration period.
- Discussed a traffic light system approach to regulating the industry. Norway and Chile use this approach.
- The draft Salmon Transfer Report (with fish health information) will be made available for discussion at the September 7, 2018 SWG meeting.

Reconciliation/Indigenous participation in aquaculture (L. Lavigne)

- Update of recent FNFC ACC meeting, where First Nations noted that their key priorities are in the areas of science, data gathering and monitoring. The SWG developed the following list of ideas related to this topic:
 - Establish a First Nation focus group with a broad spectrum of views (pro and anti-aquaculture) to solicit ideas on how to engage First Nations in aquaculture
 - Invite First Nations who are currently participating in aquaculture activities (such as sea-lice monitoring) to attend FNFC ACC meetings
 - Work with industry to support First Nation youth enrolment in biology programs (i.e. North Island College) to enhance science literacy and capacity
 - Invite ACC members to the next BCSFA Collaboration on the Coast workshop
 - Extend invitation to First Nations partners to attend SWG meetings
 - Develop list of First Nations that may be interested in technical workshops with DFO on specific issues related to aquaculture (i.e. disease management etc.)
- **ACTION ITEM:** DFO will continue to work with the Strategic Working Group on Indigenous engagement.

4. Broughton Update (L. Fettes)

- BC is continuing to move forward with the Government-to-Government process that includes the three Broughton nations that have signed a letter of understanding (LOU). Consultation requirements are beyond these three nations, but BC is not clear on the consultation process at this point.

- Recommendations related to the LOU to provincial decision-makers on options for the Broughton tenures are due by September 30, 2018. In the interim, the Province will continue to consider each application on a case-by-case basis.
- Given that there are outstanding questions on how the new BC policy will be operationalized and its implications on DFO's management of the industry including licensing and consultation DFO will be meeting with BC to discuss a path forward.
- Industry is going to request a meeting with the province to discuss their June announcement concerning the renewal of tenures and will be requesting DFO's attendance. Industry expressed concern about the province's statement that salmon farming is detrimental to wild salmon without including scientific evidence to back that up.
- With regard to the application process DFO and BC encourage industry to come to agreement with First Nations prior to submitting an application.
- There is agreement that Industry and government (federal and provincial) need to build an enduring relationship with First Nations such that they have confidence in the aquaculture industry.
- **ACTION ITEM:** DFO to follow up with BC re operational questions on new BC policy for aquaculture sites and provide information back to industry in early fall.

5. Integrated Pest Management (B. Taekema)

- B. Taekema provided a summary of a May 14, 2018 call between DFO and MOE where each agency's respective roles and responsibilities related to Integrated Pest Management were discussed.
- DFO will be meeting with Province on this topic in two weeks.
- Industry expressed concern about the provincial requirement to consult with First Nations for every peroxide use (condition of pest management permits). This may affect industry's ability to meet DFO licence conditions.
- DFO has invited MOE to participate in a future SWG meeting to provide industry information and answer questions on IMP.
- **ACTION ITEM:** DFO to follow up with BC on input to changes to MOE pesticide use permit requirements.

6. Communications - Major Farm Events (L. Lavigne)

- DFO requested that should there be a major farm event (i.e. a major fish die off) the Department should be contacted as a courtesy prior to approaching the media.

7. Sea Lice Update (Z. Waddington)

- Discussion on present management approach for sea lice and where improvements can be made.
- Slice resistance first noted in BC in 2012. Harvesting, as an alternate management action, not achieving the goal of reducing sea lice abundance. It has been the only alternative to Slice until relatively recently when hydrogen peroxide was authorized.

- Potentially three well boats used for hydrogen peroxide treatment will be in use next year along with a hydro-licer.
- Industry requires more treatment options.
- A performance management review of Slice use is required so as to better understand how to use it most effectively and timely (focus on time of out-migration) moving forward.
- DFO considering options and will be in discussions with industry in future.

8. Indigenous Engagement (B. McCorquodale)

- The federal government has committed to four priority areas for reconciliation:
 - Better internal coordination between DFO groups, including aquaculture, when negotiating with First Nations
 - Identify priority areas of First Nation interest such as monitoring and science and establish an area based approach to initiate community involvement.
 - Economic development opportunities
 - Establish a collaborative relationship with Industry to advance reconciliation approaches.

9. BCSFA Update

- An announcement on the new BCSFA Executive Director will be forthcoming in two weeks.
- The AGM is scheduled for September 27-28, 2018. The DFO Minister has been invited to attend.
- Marine Harvest will be advertising for a new Managing Director to be in place by mid-October.
- Industry expressed concern that MOE is moving too quickly on the development of new permit requirements associated with fish processing plants and wondered if MOE has contacted DFO regarding fish health aspects. Industry has not seen any draft permit requirements to date and is concerned about MOE's lack of engagement.

10. Roundtable

- Industry requested farm security stay on the agenda as it remains a hot topic.

Next meeting Date: October 30, 2018.

**FISHERIES AND OCEANS CANADA
FINFISH AQUACULTURE INDUSTRY ADVISORY PANEL (FAIAP)**

July 31, 2018 – 9:00 am – 12:00 pm

Boardroom 2-B, DFO Regional Headquarters, 401 Burrard Street, Vancouver BC

Call-in number: 1-877-413-4790 / Passcode: [REDACTED]

MODERATOR PASSCODE: [REDACTED]

ANNOTATED AGENDA

Chair: A. Webb

Participants: Industry:

[REDACTED] (BCSFA), [REDACTED] (Marine Harvest), [REDACTED]
(Grieg Seafood), [REDACTED] (Creative Salmon), [REDACTED] (Skretting),
[REDACTED] (Taplow Feeds), [REDACTED] (Cargill), [REDACTED] (Cermaq).

Province of BC:

Lesley Fettes, Myron Roth, Rudi Mayser

DFO:

Shelley Meadows, Allison Webb, Bernie Taekema, Lauren Lavigne, Brenda
McCorquodale

Secretariat: Shelley Meadows

1. Welcome, Introductions and Overview of the Agenda (Allison Webb)

2. Action items review from May 2, 2018 FAIAP Meeting (Allison Webb)

- Accept May 2, 2018 FAIAP meeting minutes
- Review action items from May 2, 2018 FAIAP meeting (see annotated action item document)
- HR update
- Fish processing plant effluent – MOE
- Standards for meeting minutes/action items drafts.....
 - Draft minutes circulated to DFO members within two weeks;
 - DFO staff to complete review of minutes and send to BT within one week;
 - Minutes circulated to industry within three weeks;
 - Call for agenda items six weeks prior to next meeting;
 - Draft agenda circulated to FAIAP membership along with meeting invite four weeks prior to next meeting;
 - Agenda and attachments sent to committee members two weeks prior to meeting.

3. Aquaculture Program Updates (Allison Webb)

Applications: Status and number of current applications (Bernie Taekema)

s.16(2)(c)

s.19(1)

A table of current aquaculture applications was distributed to FAIAP meeting attendees.

Strategic Working Group update (Lauren Lavigne)

Met on May 4 and July 26. Refer to meeting minutes.

Public Reporting (Lauren)

DFO exploring systems/resources needed to support a BarentsWatch type website

Reconciliation/Indigenous participation in aquaculture (Lauren)

FN priorities are science, data gathering and monitoring

Discussed a range of options to engage FNs

4. Broughton Decision (Lesley)

Area based management

Update from province on how provincial decision impacts management of farms in the next four years

5. Integrated Pest Management (Bernie)

Update on May 14 call with province

6. Communication – Major Farm Events (Allison)

Elevated sea lice levels in Clayoquot Sound

Major fish kills

7. Sea Lice (Zac)

Managing sea lice

8. Indigenous Engagement (standing agenda item) (Lauren)

Aquaculture Coordinating Committee of FNFC prioritized Science and Monitoring as areas where they would like to collaborate DFO and Industry.

9. BCSFA Update

10. Roundtable

11. Closing and Adjournment

→ Set next meeting date.

- Next regular quarterly occurrence of meeting would take place in October 2018.

McNabb, Melanie

From: Waddington, Zac
Sent: August-02-18 2:43 PM
To: Lavigne, Lauren; McNabb, Melanie
Subject: FW: edr application for imvixa
Attachments: HC letter july 11 18.pdf; OH Imvixa EDR july 11 18.pdf; BLH Imvixa EDR july 11 18.pdf; Sea Lice count bioassay and treatment history.pdf; Oceans Water Usage Map.pdf; Boot Lagoon Water Usage Map 2018.pdf; Ross Pass 2x5 DEPOMOD Documentation Sep26 2014.pdf; Millar Ch 2x6 DEPOMOD Documentation Nov12 2012.pdf; Growth Curve Tofino.pdf

If you read [REDACTED] letter to Health Canada for his EDR application you can see that he acknowledges Cermaq's inability to treat lice during the pre-out migration period. Therefore the situation will very likely and foreseeably result in another unmanageable out migration period in Clayoquot. That is the crux of his justification for the Emergency Drug Release (EDR) in the first place.

Zac

From: [REDACTED]
Sent: July-18-18 4:23 PM
To: Waddington, Zac
Subject: Fw: edr application for imvixa

FYI- thanks

s.19(1)



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext : [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
203 - 919 Island Hwy
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

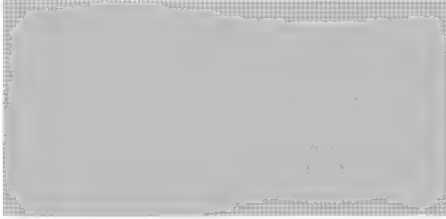
----- Forwarded by [REDACTED] on 18/07/2018 04:17 PM -----

From: [REDACTED]
To: "VDD EDR-DMV DMU" <VDDEDR-DMVDMU@hc-sc.gc.ca>
Cc: [REDACTED]
Date: 11/07/2018 04:25 PM
Subject: edr application for imvixa

Hello,

Please find attached additional documents including: 1) EDR for Invixa to be used at the Oceans Hatchery; 2) EDR for Invixa to be used at the Boot Lagoon Hatchery; 3) A summary of sea lice counts, previous treatments, and bioassay results for the two previous production cycles at Ross, Millar, and Saranac; 4) Oceans Hatchery water usage; 5) Boot Lagoon Hatchery water usage; 6) Solids waste management for Cermaq Canada; 7) Depomod information for Ross; 8) Depomod information for Millar; 9) growth information for marine sites in Tofino. If you have any questions please contact myself at my cell phone or email below. If you cannot reach me please contact [REDACTED]

Sincerely,



The information contained in this message may be CONFIDENTIAL. If you are not the addressee, please notify the sender immediately by return e-mail and then delete this message.
Any unauthorised use, dissemination of the information or copying of this message is prohibited.

s.19(1)

CERMAQ

Cermaq Canada Ltd 203-919 Island Highway
Campbell River, BC, V9W 2C2
Canada

Campbell River, 11 July 2018

To Whom it May Concern,

Hello,

We would like to apply for two Emergency Drug Releases to use the Imvixa in-feed product for the purposes of lice treatment in Atlantic salmon this fall. In particular we would like to apply for enough product to treat [REDACTED] fish at 90g coming from two hatcheries. From Oceans hatchery [REDACTED] fish at 90g will be entered into two sea sites (Ross – [REDACTED] Millar – [REDACTED]). From Boot Lagoon hatchery [REDACTED] fish also at 90g will be entered into the same two sea sites (Ross – [REDACTED] Millar [REDACTED]). See Table with numbers, weights, and approximate dates. Note that one half of the smolt entries into Ross will end up being moved to a new site (Saranac) approximately 5 months post-entry.

All of the saltwater farms mentioned above are in the Tofino area of British Columbia. SLICE (emamectin benzoate) has been effective against sea lice in this area up until this previous spring. This past spring lice levels increased above the regulatory lice level of 3.0 motile lice / fish at these three sites due to failure of SLICE due to documented reduction in lice sensitivity to emamectin benzoate. Permits to use peroxide were applied for in the fall of 2017 but not made available until May of 2018 resulting in significant lice challenges in the region with levels as high as 55.0 motile lice / fish. Peroxide use in Tofino has been restricted to well boat use only by the provincial government due to community and environmental concerns. The affected sites mentioned above have since been harvested out and remaining sites in the area have been successfully treated with peroxide. All (3) well-boats capable of peroxide treatment on this coast are leased by either Marine Harvest or Grieg Seafood. Because sea lice treatments typically province wide occur from October through February which coincides with fish moves (due to limitations on well boats all of these boats are involved in both lice treatment, smolt entries, and large fish moves) we will not have access to well-boats for effective peroxide treatments even though we have permits to use peroxide in the Tofino area. In 2017 Cermaq commissioned an alternative sea lice treatment (a Hydrolicer) but because of ship-building limitations and time to acquire funding (12 million \$) this option will not be available until April 2019. Because of documented SLICE tolerance, an inability to secure well boat use for peroxide treatments, lack of alternative saltwater sites to receive fish, and an absent third lice treatment option (hydrolicer) before April 2019 Cermaq Canada is requesting the emergency release of Imvixa for use in British Columbia to help manage lice on fish due to be entered this fall.

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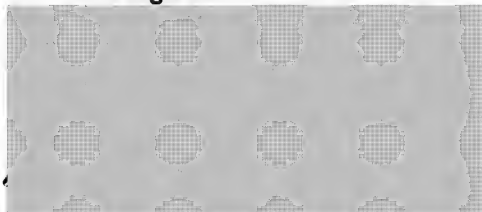
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Please find attached additional documents including: 1) EDR for Invixa to be used at the Oceans Hatchery; 2) EDR for Invixa to be used at the Boot Lagoon Hatchery; 3) A summary of sea lice counts, previous treatments, and bioassay results for the two previous production cycles at Ross, Millar, and Saranac; 4) Oceans Hatchery water usage; 5) Boot Lagoon Hatchery water usage; 6) Solids waste management for Cermaq Canada; 7) Depomod information for Ross; 8) Depomod information for Millar; 9) growth information for marine sites in Tofino. If you have any questions please contact myself at my cell phone or email below. If you cannot reach me please contact [REDACTED]

Smolt Date	Hatchery	Fish #	Smolt Sea Site	Grow Out Sea Site
Sep 30 - Oct 13	Oceans Hatchery Boot Lagoon Hatchery	[REDACTED]	Millar	Millar
Oct 14 - Oct 27	Oceans Hatchery Boot Lagoon Hatchery		Ross	Ross
Oct 28 - Nov 10	Oceans Hatchery Boot Lagoon Hatchery		Ross	Saranac
Both Hatcheries Oceans Hatchery Boot Lagoon Hatchery		[REDACTED]		

Thank you for your consideration,

Kind regards

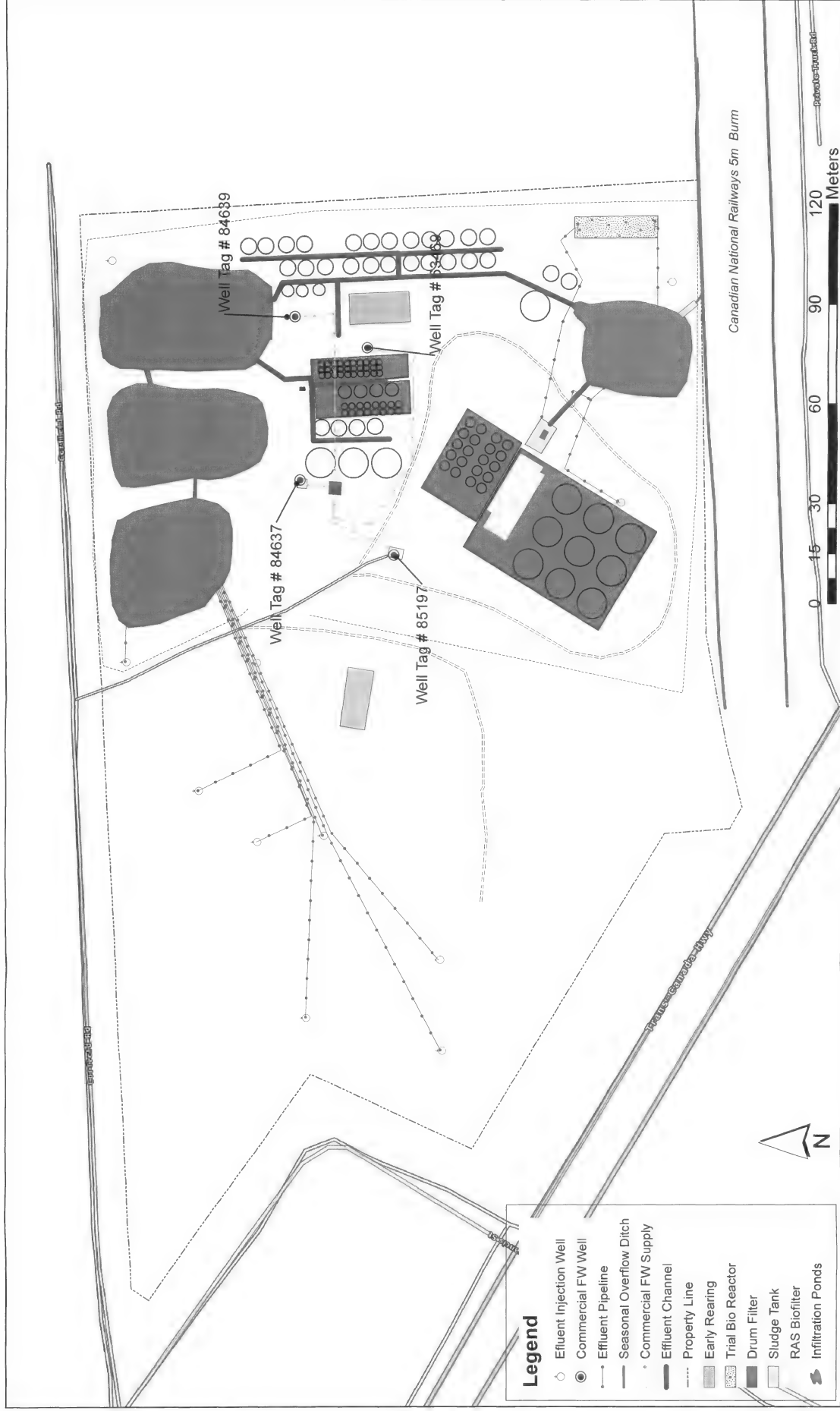


Cermaq Canada Ltd.



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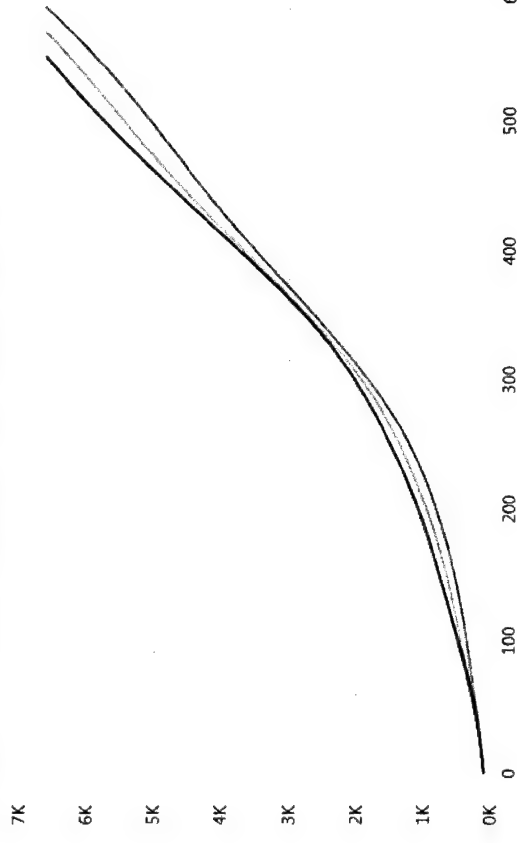
Ocean Farms Hatchery Site Map



3 different curves based on the S0 egi model with 100 gram inputs. Start of month entry's with days at sea and atu growth curves.

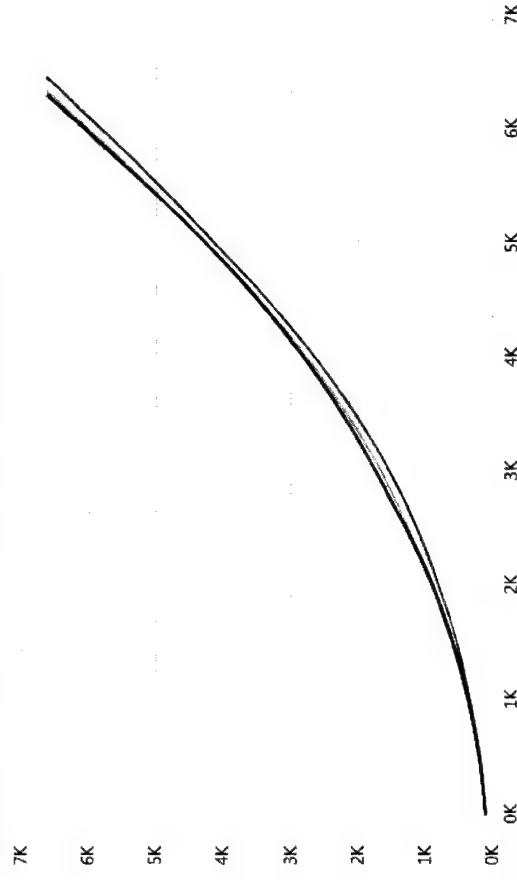
Weight [g] by Closing Days Since Input and Model Monthly

Model Monthly ● TON3 August 100 ● TON3 October 100 ● TON3 September 100



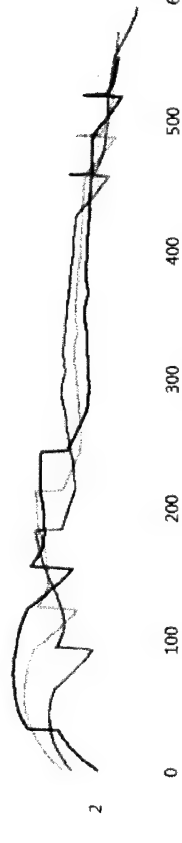
Weight [g] by ATU and Model Monthly

Model Monthly ● TON3 August 100 ● TON3 October 100 ● TON3 September 100



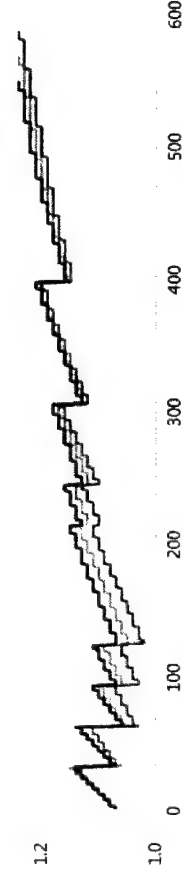
Thermal growth coefficient (TGC) by Closing Days Since Input and Model Monthly

3



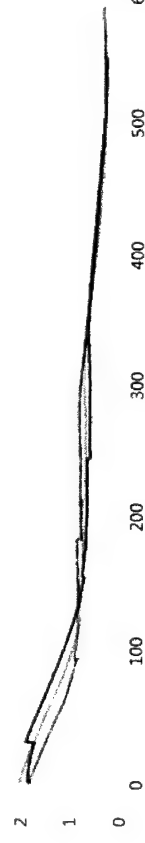
FCR and FCR by Closing Days Since Input and Model Monthly

3



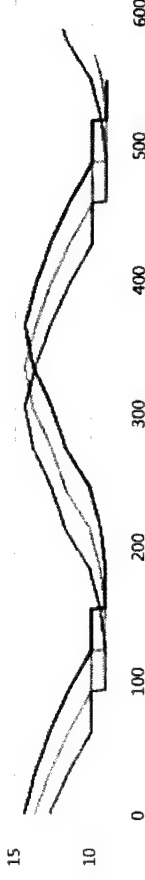
SGR by Closing Days Since Input and Model Monthly

2



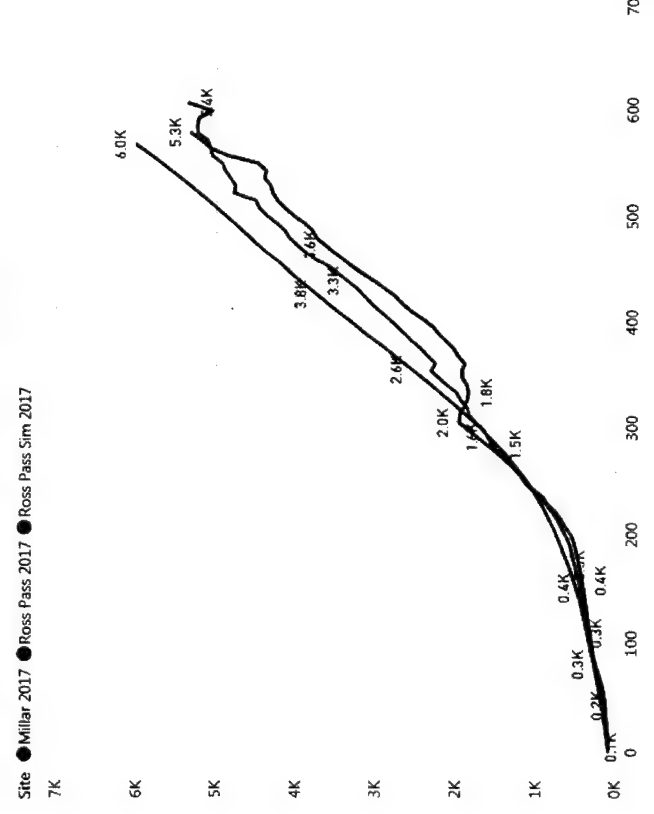
Temperature [°C] by Closing Days Since Input and Model Monthly

2

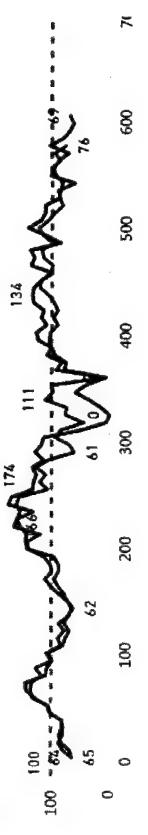


This is what Millar and Ross looked liked this YC with a 86 gram entry in late Sep.

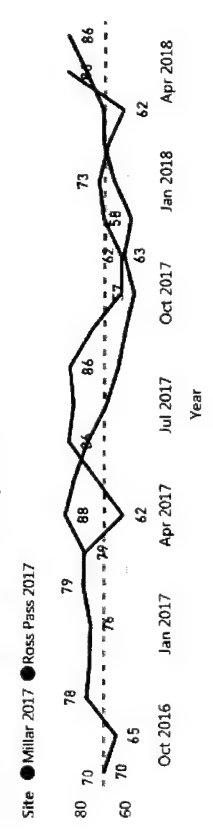
Closing Avg weight and Earliest Date by Closing Days since first input and Site



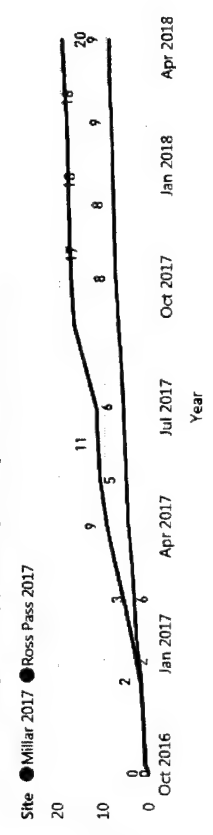
Appetite (%) in Period
Site ● Millar 2017 ● Ross Pass 2017



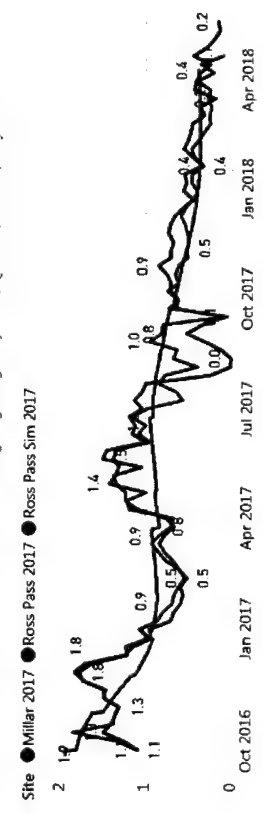
Oxygen saturation (5.0 meters) Min (%) in period



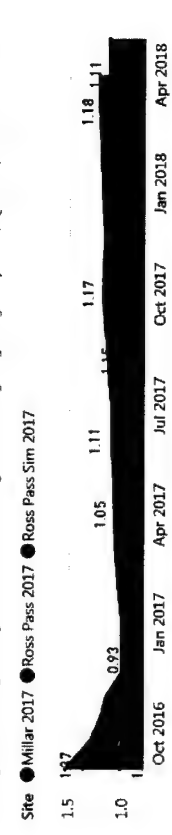
Average of Closing Mortality percent by Year, Quarter, Month and Site



Simple SFR in period, Earliest Date and Closing Avg weight by Year, Quarter, Month, Day and Site



Average of Closing Biological FCR and Average of Closing Avg weight by Year, Quarter, Month and Site





Health Canada Santé Canada

EMERGENCY DRUG RELEASE APPLICATION AND FEE FORM /
FORMULAIRE DE DEMANDE DE DISTRIBUTION DE MÉDICAMENTS D'URGENCE ET D'ÉTABLISSEMENT DES FRAIS

Veterinary Drugs Directorate / Direction des médicaments vétérinaires
Holland Cross Complex, Tower A, Ground Floor, Address Locator : 3000A
Complexe Holland Cross, Tour A, Rez-de-chaussée, Indice de l'adresse : 3000A
14-11 Holland Avenue, Ottawa, ON K1A 0K9

Tel / Tél. : (613) 240-3916 Fax / Télécopieur : (613) 946-1125 Email: hc.edr-dmu.sc@canada.ca

Manufacturer Name & Address / Nom et adresse du fabricant Novartis Sante Animale S.A.S., Usine de Huningue, 26, Rue de la Chapelle, F-68330 Huningue, France		Tel/Tél. : Fax/Télécopieur :
		Contact / Personne Ressource
Drug Brand Name & Strength/ Nom commercial & concentration du médicament Imvixa 10%, Lufenuron 10%, oral powder		Active Ingredient / Principe actif Lufenuron
Quantity requested / Quantité demandée 30.0 kg premix	Clarify maximum for 6 month. / Clarifiez maximum pour 6 mois. 30.0kg premix	Date(s) drug will be used / Date(s) de l'utilisation du médicament Sep 30 to Nov 10, 2018
Dosage & Route of Administration / Posologie & voie d'administration 5mg/kg/day orally for 7 days		
Veterinary Practitioner Name & Address / Nom et adresse du vétérinaire Cermaq Canada Ltd, 203-919 Island Highway, Campbell River, BC V9W 2C2, Canada		Tel. / Tél. : Fax / Télécopieur : 250-286-0042 E-mail / Courriel :
Billing address (if different) / Adresse de facturation (si différente)		Billing contact person / Personne ressource pour la facturation
Veterinary Situation, Disease, Justification / Justification de l'utilisation, maladie, diagnostic Lepeopcheirus salmonis infestation with reduced sensitivity to emamectin benzoate		
Species / Espèce Atlantic Salmon	Number of animals, age, weight, sex / Nombre d'animaux, âge, poids, sexe 89g	
Animal's Name and Owner's Name (for pets and horses) / Nom de l'animal et nom du propriétaire (pour les animaux de compagnie et les chevaux)		
Producer's Name and address, unit (for farms and/or breeding units) / Site de production, nom du producteur et adresse, unité (pour les fermes et/ou les centres d'élevage) Cermaq Canada Ltd		
Production Site (for aquaculture) / Site de production (aquaculture) Oceans Hatchery		
Previous follow-up report / Rapport de suivi précédent : has been sent / a été envoyé _____ is attached / est inclus _____ other (explain) / autre (explication) N/A		
If applicable, please provide a written statement that animals to which this drug is administered will not be used in food for human consumption. ***Si approprié, veuillez spécifier que les animaux auxquels ce médicament est destiné ne seront pas utilisés dans l'alimentation pour la consommation humaine.*** An EDR for a non food animal is \$50.00; for a food animal is \$100.00; you will be invoiced by Health Canada for your EDR request. / Une DMU pour un animal non destiné à l'alimentation coûte \$50.00 et \$100.00 pour un animal destiné à l'alimentation. Santé Canada vous fera parvenir une facture relativement à votre demande de DMU.		

VETERINARIAN'S SIGNATURE:

DATE: July 11, 2018

HC use only / À l'usage exclusif de la SC	EDR no. / No. de la DMU	NF	F
Customer no. / No. De Client	Invoice no. / No. de la facture	S.O. no / No. d'engagement	

04.03.22

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EMERGENCY DRUG RELEASE APPLICATION AND FEE FORM /
FORMULAIRE DE DEMANDE DE DISTRIBUTION DE MÉDICAMENTS D'URGENCE ET D'ÉTABLISSEMENT DES FRAIS

Veterinary Drugs Directorate / Direction des médicaments vétérinaires
Holland Cross Complex, Tower A, Ground Floor, Address Locator : 3000A
Complexe Holland Cross, Tour A, Rez-de-chaussée, Indice de l'adresse : 3000A
14-11 Holland Avenue, Ottawa, ON K1A 0K9

Tel. / Tél. : (613) 240-3916 Fax / Télécopieur : (613) 946-1125 Email: hc.edr-dmu.sc@canada.ca

Manufacturer Name & Address / Nom et adresse du fabricant Novartis Sante Animale S.A.S., Usine de Huningue, 26, Rue de la Chapelle, F-68330 Huningue, France		Tel/Tél. : Fax/Télécopieur :	
Drug Brand Name & Strength/ Nom commercial & concentration du médicament Imvixa 10%, Lufenuron 10%, oral powder		Active Ingredient / Principe actif Lufenuron	
Quantity requested / Quantité demandée 30.0 kg premix	Clarify maximum for 6 month. / Clarifiez maximum pour 6 mois. 30.0kg premix		Date(s) drug will be used / Date(s) de l'utilisation du médicament Sep 30 to Nov 10, 2018
Dosage & Route of Administration / Posologie & voie d'administration 5mg/kg/day orally for 7 days			
Veterinary Practitioner Name & Address / Nom et adresse du vétérinaire Cermaq Canada Ltd, 203-919 Island Highway, Campbell River, BC V9W 2G2, Canada		Tel. / Tél. : Fax / Télécopieur : 250-286-0042 E-mail / Courriel :	
Billing address (if different) / Adresse de facturation (si différente)		Billing contact person / Personne ressource pour la facturation	
Veterinary Situation, Disease, Justification / Justification de l'utilisation, maladie, diagnostic Lepeoptheirus salmonis infestation with reduced sensitivity to emamectin benzoate			
Species / Espèce Atlantic Salmon	Number of animals, age, weight, sex / Nombre d'animaux, âge, poids, sexe 88g		
Animal's Name and Owner's Name (for pets and horses) / Nom de l'animal et nom du propriétaire (pour les animaux de compagnie et les chevaux)			
Producer's Name and address, unit (for farms and/or breeding units) / Site de production, nom du producteur et adresse, unité (pour les fermes et/ou les centres d'élevage) Cermaq Canada Ltd			
Production Site (for aquaculture) / Site de production (aquaculture) Boot Lagoon Hatchery			
Previous follow-up report / Rapport de suivi précédent : has been sent / a été envoyé _____ is attached / est inclus _____ other (explain) / autre (explication) N/A			
If applicable, please provide a written statement that animals to which this drug is administered will not be used in food for human consumption. ***Si approprié, veuillez spécifier que les animaux auxquels ce médicament est destiné ne seront pas utilisés dans l'alimentation pour la consommation humaine.*** An EDR for a non food animal is \$50.00 ; for a food animal is \$100.00 : you will be invoiced by Health Canada for your EDR request. / Une DMU pour un animal non destiné à l'alimentation coûte \$50.00 et \$100.00 pour un animal destiné à l'alimentation. Santé Canada vous fera parvenir une facture relativement à votre demande de DMU.			

VETERINARIAN'S SIGNATURE: _____

DATE: July 11, 2018

HC use only / À l'usage exclusif de la SC	EDR no. / No. de la DMU	NF	F
Customer no. / No. De Client	Invoice no. / No. de la facture	S.O. no / No. d'engagement	

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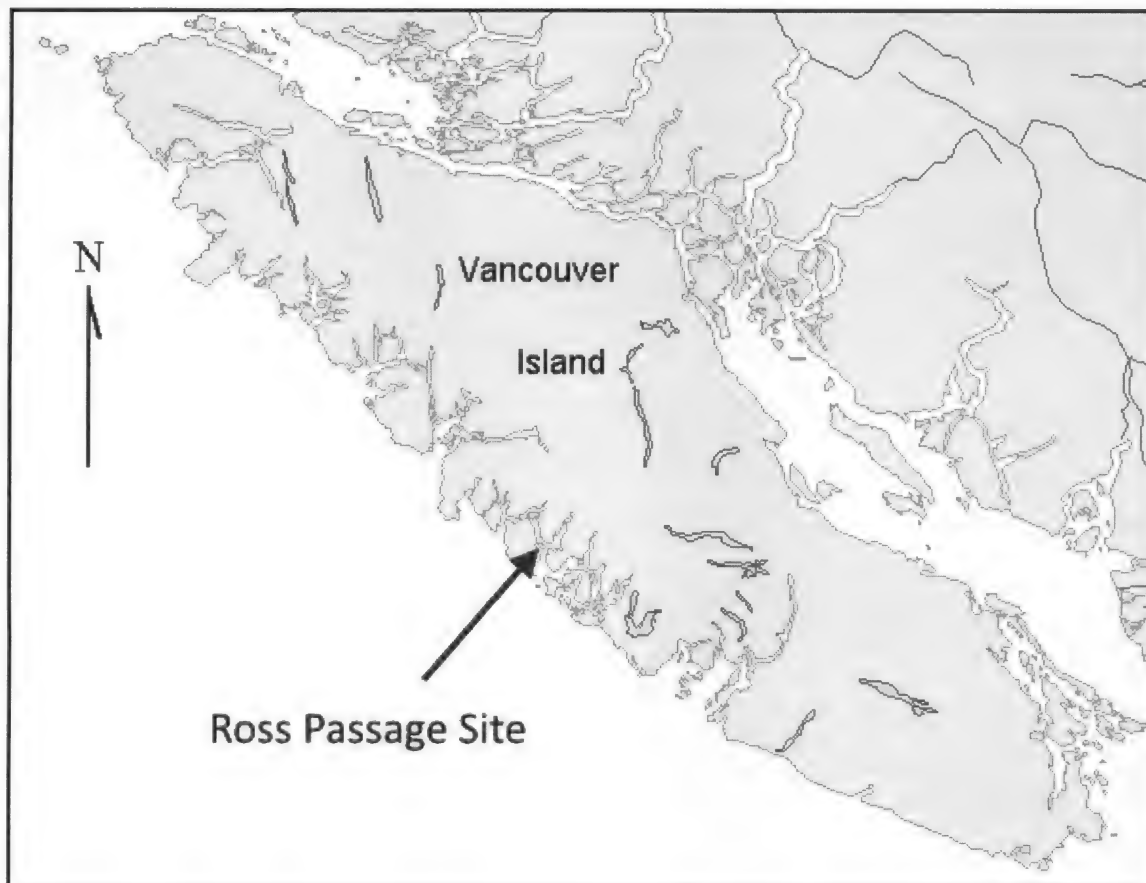
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DEPOMOD Documentation for
Cermaq Canada Ltd. Ross Pass Site
Clayoquot Sound
Current Operation: 2 x 5 Pens Configuration



September 26, 2014

1.0 DEPOMOD prediction of waste distribution

DEPOMOD (DEPOMOD v 2.2 Jan. 2001;) was used to predict the distribution of wastes at the Ross Pass site (Figure 1) for Cermaq Canada Ltd.. DEPOMOD is a model developed in Scotland (Cromey *et al*, 2002a) to assist in location of fish farms and in the regulatory process by predicting the waste accumulation on the seabed arising from fish farms.

DEPOMOD uses local currents, bathymetry, pen location and size and feed quantities to predict the extent of distribution or “footprint” of the farm wastes as total solids or as organic carbon calculated over a period of time or as fluxes (fluxes were predicted for the Ross Pass site for maximum and average feed). Information on the models and field validation are presented by Cromey *et al* (2002a and b).

The model consists of a series of modules or sub-models

- A grid development module with depth/ pen, etc. location
- a particle tracking model
- a resuspension/organic decay module (resuspension was not used)
- a semi-empirical benthic impact module (not used)

It has been noted that aspects requiring further investigation include application of the model at depths greater than about 70 meters and areas and/or with steep depth gradient (C. Cromey at BCARDC Workshop on Wastes, Nov. 25&26, 2003). The model is undergoing validation in BC conditions. Modeling has been undertaken by IEC to the best of our ability using supplied data and information and DEPOMOD Version 2.2. It should be noted that the results are estimates only and subject to the above conditions and limitations.

Current meters were deployed at the site and collected data May 14 to June 20, 2014. Modeling using DEPOMOD has been undertaken in September, 2014 using 30 days of the collected current data and reported in the present document.

For the Ross Pass site, Table 1 presents inputs used for DEPOMOD, Figure 1 indicates the grid area used in the model and Figures 2 and 3 present the flux predictions without resuspension for the period of maximum feed input and for average feed input. Surface areas of various contour levels (grams of carbon per square meter per day) of predicted footprint based on maximum and average feeding are shown in Table 2. Mass balance calculations to determine the quantity and percent of waste material that were predicted to be deposited within the model area are included in Table 3. Hydrographic information is summarized in Section 2 below.

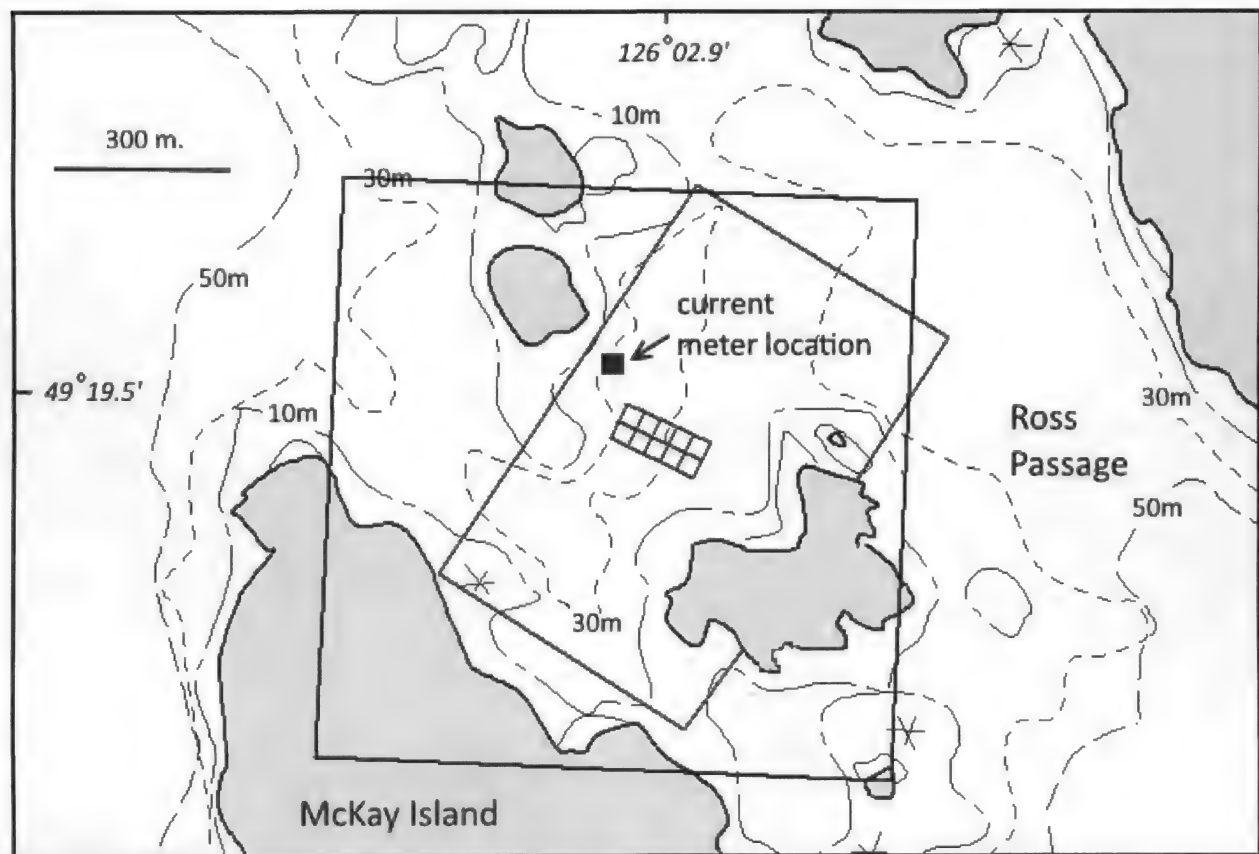


Figure 1. Diagram indicating 1000 by 1000 meter grid area used in DEPOMOD (black) at the Ross Pass site, tenure boundary (blue), pen location (blue) and current meter location.

Table 1. Site and input factors used with DEPOMOD for prediction of probable footprint at the Cermaq Canada Ltd. Ross Pass site (2x5 pens) September, 2014.

Site Name:	Ross Pass
Company:	Cermaq Canada Ltd.
Location:	49 deg 19.521' 126 deg 02.975'
Land File #:	1405933
Pens	
Number and type of Cages	10 square pens
Dimensions of net cages (m)	Pen Length: - 30m Pen Width - 30m Pen Depth: - 15m
Groups of net cages and orientation	2 rows of 5 pens at 115 Deg T along length
Longitudinal spacing between cage centres (m):	32m Distance
Transverse spacing between cage centres (m):	33m
Surface area of cages (m²)	~900*10 = 9000 m ²
Coordinates of first cage centre by group (UTM or lat/long):	49 deg 19.458' 126 deg 02.961' 49 deg 19.475' 126 deg 02.951'
Feed and Grow-out	
Maximum Daily Feeding Rate (kg/day):	Feed input/pen at peak feed volume: 940kg/day @ 15 months
Average Daily Feeding Rate over the grow-out period (kg/day):	Average feed input/pen: 520 kg/day
Total feed budget for grow-out period (tonnes)	3,051 tonnes
Approx. Farm production	
Duration of grow-out period (months)	
Hydrographic:	
Current meter mooring location (UTM or lat/long):	49 deg 19.521' 126 deg 02.975' NAD83
Height of Mean Water Level above chart datum (m)	2.15m (Riley Cove)
Depth at cage group position	20 to 40 m (from bathymetry depth)
Number of current velocity data sets used	2
Heights of mooring above sea bed	5,18 m
Depth of water column at mooring	33m
Length of current velocity record	30 days
Sampling interval (mins)	30 min converted to hourly with DFO-provided tool (courtesy Jon Chamberlain)
Time step of data used in model	60 min
Total number of time steps used in model	720
Mooring position	70 m at 340 degrees T from the N corner of pens

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Table 1 Contd.

Bathymetry from	<ul style="list-style-type: none"> From bathymetry provided as 25m grid by Ocean Dynamics Canada Ltd. and Coast Spatial GIS & Mapping Specialists. (The DGPS receiver used for the bathymetric survey is a Trimble Pro XRB; sonar is a high end Lowrance X-15 with custom software supplied by Lowrance and a custom transducer capable of 2400 feet in salt water; boat speed of 1 - 2.5 meters/second yields a maximum distance of 4 to 5 meters between soundings; transects are generally 10 meters apart within the actual lease boundary and 15 meters apart outside the boundary; 2004 info; areas outside boundaries may be supplemented by CHS data as necessary)
Modeling:	
Area	– x = 1000m; y = 1000m
Grid Origin	– 713905 5467132 UTM9 NAD83
Major Grid/ Minor Grid sizes	– 25x25m/ 10x10m
Food water content	– 10%
Digestibility of feed	– 90%
% Carbon in feed	– 57%
% Carbon in faeces	– 33%
Food wasted as % of food fed	– 3%
Food particle settling velocity distribution	– 11.0cm/s
Faecal particle settling velocity distribution	– 3.2cm/s SD 1.1 cm/s
Turbulence Model	– Random Walk
Horizontal dispersion coefficients	– 0.1 m ² ./s
Vertical dispersion coefficient	– 0.001 m ² ./s
Trajectory evaluation accuracy	– High 60s
Number of particles used	– 10
Resuspension Model/ Options	– OFF
Other Models	– Not used
Output	– Flux (grams C/m ² /year; calc. to /day)

Contact regarding model simulations



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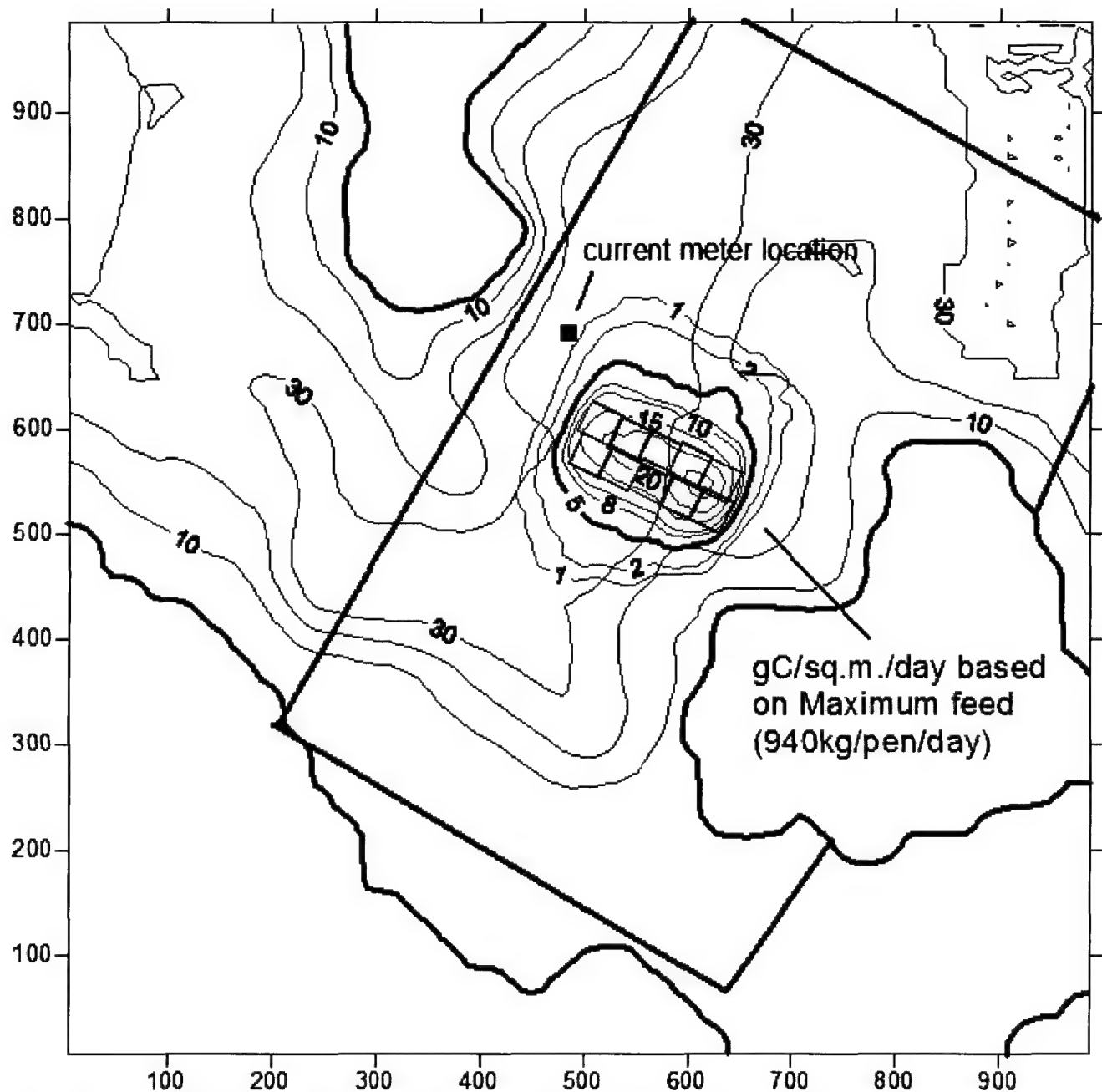


Figure 2. DEPOMOD predicted footprint contours based on maximum feeding. Pen centers are boxes; heavy blue lines are boundaries. Blue contour lines are depths in meters.

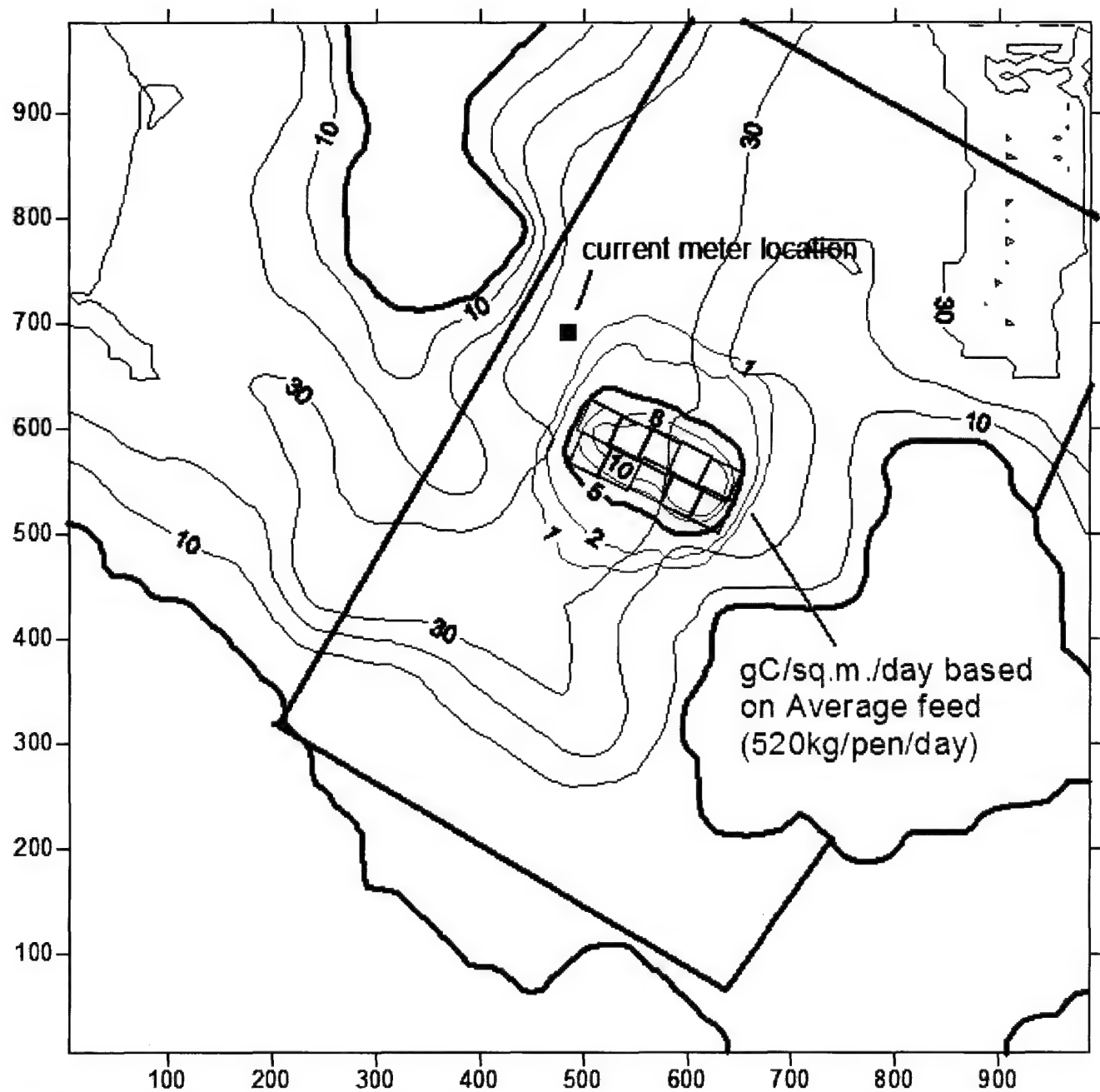


Figure 3. DEPOMOD predicted footprint contours based on average feeding. Pen centers are boxes; heavy blue lines are boundaries. Blue contour lines are depths in meters.

Table 2. Surface area of predicted footprints contours based on maximum (above) and average (lower) feeding

Maximum Feed gC/sq.m./day	No Resuspension	
	Surfer	Positive Planar Area [cut] (sq.m.)
1		52,297
2		40,852
5		25,047
8		17,449
10		14,556
15		9,225
20		4,472
30		0

Average Feed gC/sq.m./day	No Resuspension	
	Surfer	Positive Planar Area [cut] (sq.m.)
1		42,504
2		30,600
5		15,843
8		9,749
10		6,246
15		0

Table 3. Mass balance calculations for the Ross Pass site to determine the quantity and percent of material deposited within the model area based on maximum (upper) and average (lower) feeding. (method used as in DCP150 - DFO Marine Fish Habitat Information Requirements for Finfish Aquaculture Projects).

Maximum feed

Surfer Positive Volume [cut] value/day in grid area	No Resuspension
	415,199 g C
# pens	10
feed per pen/day/pen (kg)	940 kg
or	940,000 g
total feed, all pens	9,400,000 g
X	<u>0.044</u>
feed X 0.044 (C calc. as in method)	413,600 g C
C deposited in grid area as % of expected from feed	100.4%

Average feed

Surfer Positive Volume [cut] value/day in grid area	No Resuspension
	229,685 g C
# pens	10
feed per pen/day/pen (kg)	520 kg
or	520,000 g
total feed, all pens	5,200,000 g
X	<u>0.044</u>
feed X 0.044 (C calc. as in method)	228,800 g C
C deposited in grid area as % of expected from feed	100.4%

2.0 Hydrographic Data

Information about the current meters and their location and deployment is presented in Table 4.

Table 4. Current meter and deployment information.

Equipment

Meter(s):	<ul style="list-style-type: none"> - Nortek Aquadopp Current Profiler: Aquapro 400khz (see Figure 4 for specification sheet) - Serial Number: AQD4876 - Last calibration and servicing – May 7, 2008
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Current Meter Deployment

Meter location:	<ul style="list-style-type: none"> - Cermaq Canada Ltd. Ross Pass site at a location 70 meters at 340 degrees T from the N corner of pens - 49 deg 19.521' 126 deg 02.975' NAD83; see Figure 5).
Magnetic declination	- For the site, Magnetic North = 17.2 degrees True
Depth at location:	- 33 meters
Tidal range:	- 4.4 meters based on Riley Cove current station
Mean Water Level:	- 2.15 meters based on Riley Cove current station
Meter recording Depths:	<ul style="list-style-type: none"> - surface (15meter depth) - near-bottom (5 meters above the sea floor at 28 meters depth)
Record type:	<ul style="list-style-type: none"> - sample current speed and direction at 30-minute intervals over 30 days - averaging
Averaging period:	- 2 minutes
Mooring:	- see figure 6 for description
Start:	- 00:00 PST (UTC-8) May 14, 2014 (as used in Depomod)
End:	- 23:30 PST (UTC-8) June 12, 2014 (as used in Depomod)
Number of data points:	- 1,440
Deployed by:	- Ocean Dynamics

Data Analysis

The data is normally reviewed using Textpad program and data collected before deployment and/or after retrieval is deleted for use. Pre and post-retrieval data is determined from field records and is normally also evident in sharply increased or decreased (depending on surface air temperature) temperature readings and/or in conjunction with other changed readings, depending on the type of meter. Data is further evaluated for any evident problems. If the data appears satisfactory, Magnetic current direction data is converted to True based on variation from Geomagnetism Magnetic declination calculator (<http://geomag.nrcan.gc.ca/apps/mdcal-eng.php>) using an Excel program created by IEC for the purpose (for the site, Magnetic North = 17.2 degrees True). Analysis took place on the 30 days of data collected at 30 minute intervals (averages over 2 minute period every 30 minutes). An Excel file was used to produce and output the current speed/ direction array. The array is copied to an Excel file that uses the data to provide tabular and graphic summaries of the current speed and direction for the data.

Results are presented in Tables 5 to 7 and Figures 5 and 7 to 18. A toolkit provided by DFO (courtesy of Jon Chamberlain) at a July/04 DEPOMOD workshop to aid in the visual analysis of hydrographic data has been used to prepare Figures 9 to 18 for review.

Table 5. Average current speed and direction for the 30 day period including 1440 records. Note that average direction does not indicate dominant direction(s) in all cases.

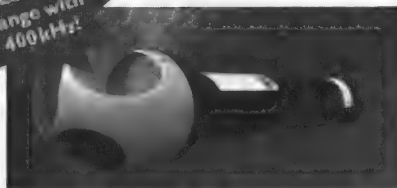
	Top	Bottom
Average direction (Deg T)	4.0	283.8
Speed cm/s		
Max	28.8	23.5
Min	0.4	0.3
Average	9.2	7.0
% of time > 5cm/s	79%	67%

The Ross Passage site is within an irregular passage area with several islands and rocky areas. Upper (15m depth) currents recorded showed general trends roughly to the NE and SW along the nearby upper depth contours; lower currents (28m depth) were more variable in direction but with some N and S trends, possibly due to corresponding deeper bathymetry. Current speeds recorded were slightly higher at the upper depth.

Aquadopp® Profiler

A small and light current profiler for coastal measurements

Longer range with 400kHz!



The Aquadopp® profiler measures the current profile in water using acoustic Doppler technology. It is designed for stationary applications and can be deployed on the bottom, on a mooring rig, on a buoy or on any other fixed structure. It is a complete instrument and includes all the parts required for a self contained deployment with data stored to an internal data logger. Typical applications include coastal studies, online monitoring and scientific studies in rivers, lakes, and channels.

The Aquadopp® profiler uses three acoustic beams slanted at 25° to accurately measure the current profile in a user selectable number of cells. The internal tilt and compass sensors tell the current direction and the high-resolution pressure sensor gives the depth—and the tidal elevation if the system is fixed mounted. The standard 9MB recorder and internal alkaline batteries are typically sufficient for a 2–4 month deployment.

Deployment times can be increased or sampling schemes intensified by expanding to 161MB memory and external batteries.

Practical Use

One quick glance at the Aquadopp profiler tells you that it is a small and practical current profiler that is simple to deploy. It gives you the full current profile and it comes standard with all the trimmings such as an internal recorder, compass, tilt, pressure, temperature, software, cable, etc.

Go one step further into the system and you will find a host of new features:

- ✓ Small blanking distances give you data close to the instrument
- ✓ Small cell sizes even in high flows
- ✓ Compass and tilt that automatically senses up or down orientation (use the profiler either way)
- ✓ Adjustable power output reduces battery consumption in shallow water
- ✓ All plastic and titanium parts, from 2.4kg in air
- ✓ Flexible transducer design—order special heads at low additional cost
- ✓ Powerful AquaPro Win32® software for trouble free deployment planning, recording, data retrieval, and ASCII conversion
- ✓ Online data communication via radio modem
- ✓ Collect directional wave data at 1Hz or 2Hz in between current profiles
- ✓ Inquire for deep water versions

Wave Directional Data

The Aquadopp can be configured to collect 1Hz or 2Hz wave data (p,U,V) interleaved with the mean current profile. The 1Hz or 2Hz data allow you to calculate the wave height, period, and direction, either using Nortek add-on wave software or your own algorithms. The instrument is best suited for wave measurements in areas with long waves ($T_p > 4-5$ s). For other areas or for long-term online measurements, we suggest looking at the AWAC as an alternative.

Third Generation Current Profiler

Nortek is proud to be the first company that introduced a third generation current profiler. The first generation was the original ADCP, a bulky and expensive, but revolutionary instrument first introduced in 1982. The second

generation profilers were introduced in 1994, which reduced the size, weight, and price by about 50%. The Aquadopp profiler, introduced in 2002, repeats the feat—a 50% reduction in size, weight, and price while producing the best performance, versatility and functionality yet.

www.nortek.no

Figure 4. Specifications for Aquadopp Current Profilers from website: www.nortek.no.

Specifications

Water velocity measurement

Acoustic frequency	0.4MHz	0.6MHz	1.0MHz	2.0MHz
Maximum profiling range ^{a)}	60-90m	30-40m	12-20m	4-10m
Cell size	2-8m	1-4m	0.3-4m	0.1-2m
Minimum blanking	1m	0.50m	0.20m	0.05m
Maximum # cells	128			
Velocity Range	±10m/s (call for extended range)			
Accuracy	1% of measured value ±0.5cm/s			
Max. Sampling rate	1Hz			
Velocity uncertainty	Consult software program			

^{a)} The Aquadopp profiler measures the current profile in a user specified number of cells from the instrument out to a maximum range that depends on the acoustic scattering conditions. The lower range should be expected with clear water and small cells and the higher range with large cells and acoustically turbid water.

Echo intensity

Sampling	Same as velocity
Resolution	0.45dB
Dynamic range	90dB

Transducer

Frequency	0.4MHz	0.6MHz	1.0MHz	2.0MHz
Number of beams	3	3	3	3
Beam width	3.7°	3.0°	3.4°	1.7°

Standard sensors

Temperature	Thermistor embedded
Range	-4°C to 30°C
Accuracy/resolution	0.1°C/0.01°C
Time response	10 min

Compass	Flux gate with liquid tilt
Maximum tilt	30°
Accuracy/resolution	2°/0.1°

Tilt	Liquid level
Accuracy/resolution	0.2°/0.1°
Up or down	Automatic detect
Pressure	Piezoresistive

Range	0-100m (standard)
Accuracy/resolution	0.25%/0.005% of full scale

Analog inputs

Number of channels	2
Voltage supply	Battery voltage. Hardware can be modified to provide 5V or 12V
Voltage input	0-5V
Resolution	16 bit A/D

Serial data communication

I/O	RS232, RS422.
	Software supports most commercially available USB-RS232 converters
Baud rate	300-115200 (user setting)

Internal recording

Capacity	9MB, expandable to 33, 89, or 161MB
Data record	32 bytes + 9xNcells
Mode	Stop when full (default) or wrap mode

Software "AquaPro"

Operating system	Windows®2000, Windows®XP
Functions	Deployment planning, data retrieval, ASCII conversion, online data collection, and graphical display

Power

DC Input	9-16VDC
Max average consumption at 1Hz	0.2-1.5W
Sleep consumption	0.0013W
Transmit power	0.3-20W, 4 adjustable levels

Internal batteries

Type/capacity	18 AA Alkaline cells/50Wh
New battery voltage	13.5VDC
Duration (10-minute avg)	80 days for 2MHz, 0.5m cells
Duration (10-minute avg)	50 days for 1MHz, 1.0m cells

Exact battery consumption and velocity uncertainty are complex functions of the deployment configuration. Please consult the AquaPro software for more exact predictions.

Materials

Standard	Delrin and polyurethane plastics with titanium screws
----------	---

Intermediate and deep-water models	Titanium and Delrin plastics
------------------------------------	------------------------------

Connectors

Bulkhead (Impulse)	MCBH-8-FS
Cable	PMCL-8-MP on 10-m polyurethane cable

Environmental

Operating temperature	-5°C to 35°C
Storage temperature	-20°C to 45°C
Shock and vibration	IEC 721-3-2
Shallow water rating	300m

Dimensions

Weight in air	2.4kg/2.6kg (0.6MHz)/3.7kg (0.4MHz) with alkaline batteries
Length	550mm
Diameter	75mm

Options

Batteries	Lithium, Li-Io rechargeable 540Wh or 1200Wh
External batteries	Titanium instead of bronze
Bulkhead connectors	Right angle head for 1 or 2MHz.
Transducer head	Inquire for special configurations
	Inquire for 2000- & 6000-m versions
Deep water systems	Request special harness for RS422 communication.

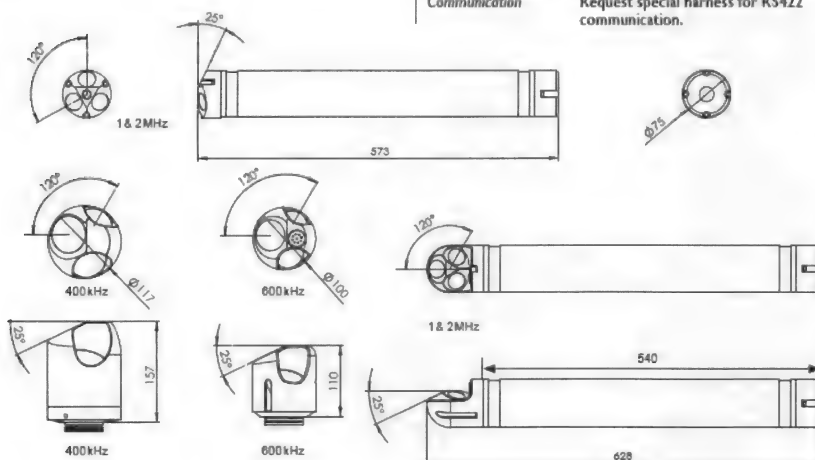


Figure 4 contd.

NORTEK AS
Vangskrokk 7
NO-1351 Rud
Norway
Tel: +47/ 6717 4500
Fax: +47/ 6713 6770
E-mail: inquiry@nortek.no

青岛诺泰克测量设备有限公司
地址: 中国青岛香港西路65号
汇融广场1302
邮编: 266071

Tel: 0532-85017570, 85017270
Fax: 0532-85017570
E-mail: inquiry@nortek.com.cn

NortekUK
Mildmay House, High St.
Hartley Wintney
Hants, RG27 8NY
Tel: +44- 1428 751 953
Fax: +44- 1428 751 533
E-mail: inquiry@nortekuk.co.uk

NORTEKUSA
222 Severn Avenue
Suite 17, Building 7
Annapolis, MD 21403
Tel: +1 (410) 295-3733
Fax: +1 (410) 295-2918
E-mail: inquiry@nortekusa.com
www.nortekusa.com

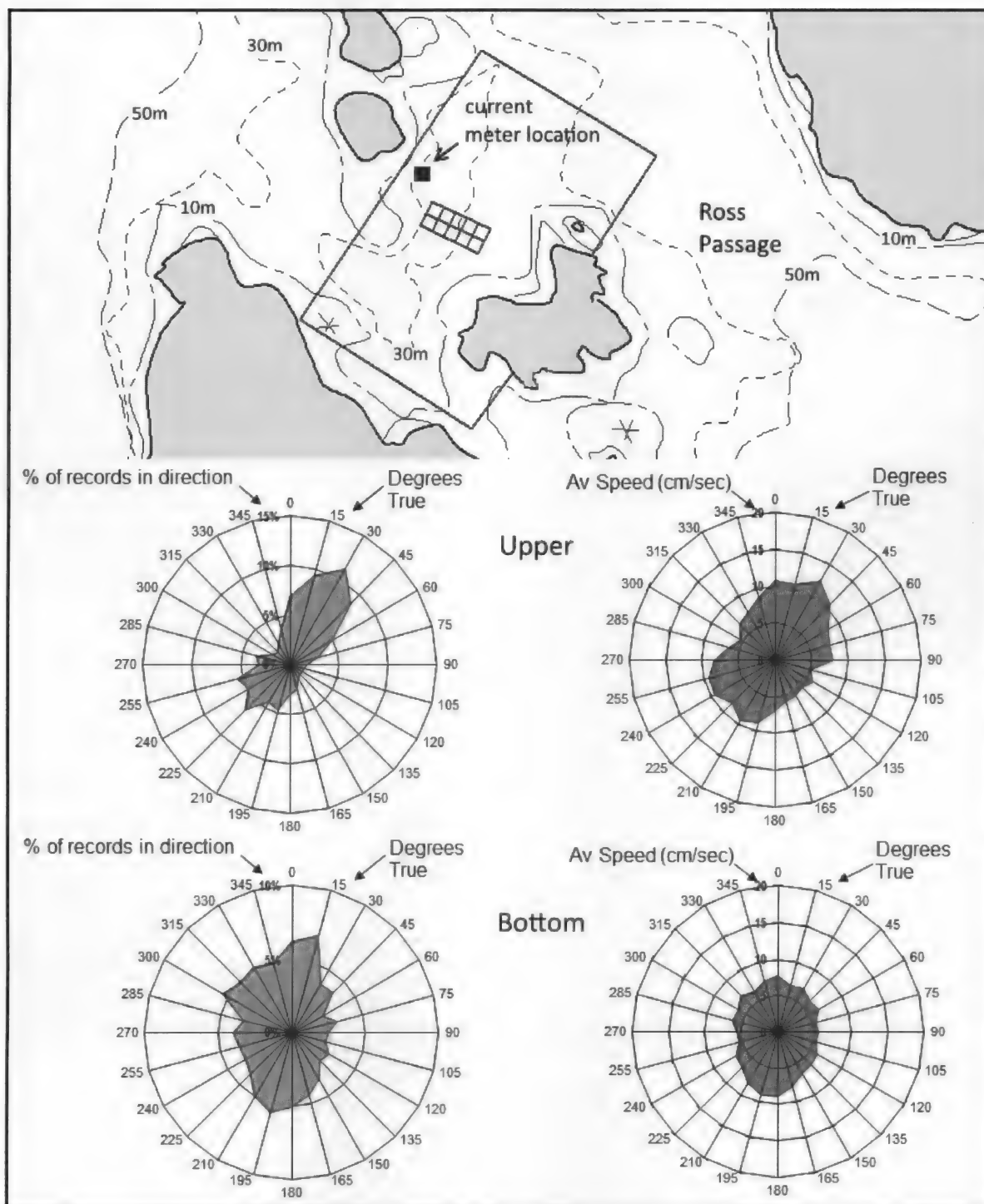
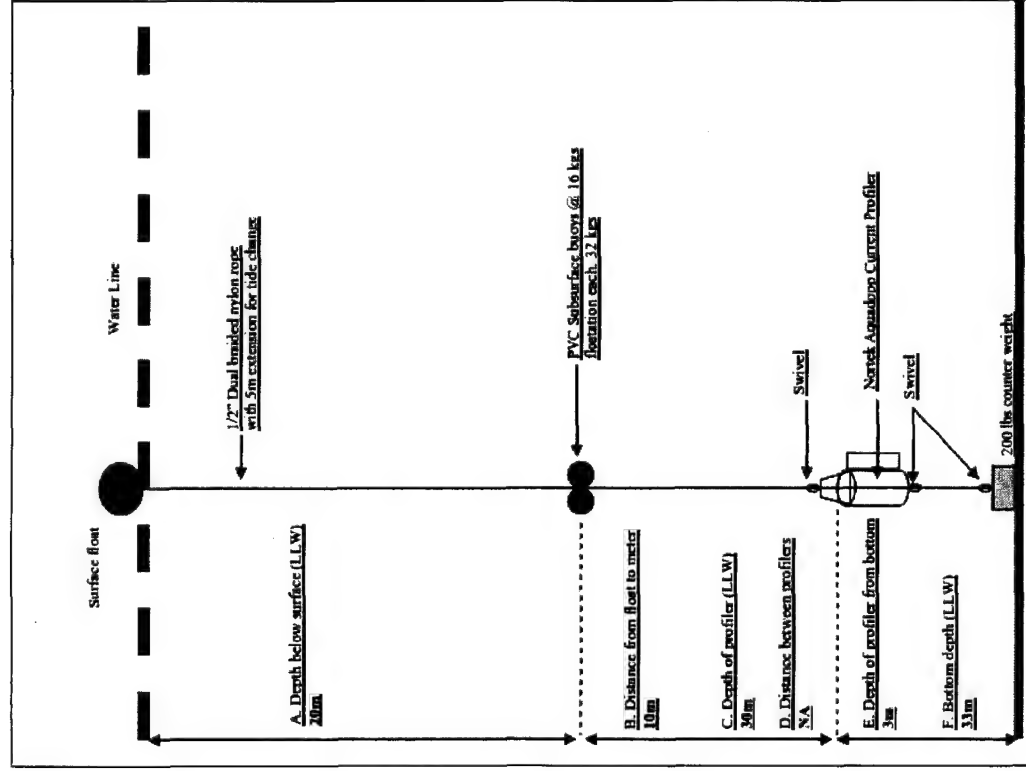


Figure 5. Diagram indicating relation of current measurements at the Ross Pass site for the May 14 to June 12, 2014 period. Average speed recorded and the percent of records in each direction (in which current flows) category are shown for the upper and lower meters. The site diagram has been aligned with true north at the top of the page as shown in the current graphs.

Current Profiler Schematic for Ross Pass June 2014.



Company Completing Assessment: Ocean Dynamics inc.

Current Meter Manufacturer and Model: Aquadopp Current Profiler

Serial Number: AQD 4876

Last calibration date: May 7, 2008

Last Service date: May 7, 2008

Deployment Date: 05/13/2014 Time: 11:30:00 AM

MM/DD/YYYY PDT

Recovery Date: 06/20/2014 Time: 08:00:00 AM

MM/DD/YYYY PDT

Mooring Location:

NAD-27

Latitude: 49 19.521

NAD-83

Longitude: 126 02.975

Sampling Interval:

Instantaneous:

2 Minutes

Averaging:

120 Samples

Subsurface Floatation:

Description: Two 10kg hard floats

Floatation: 32 kg

Anchor:

Description: Five 18kg Cannon Balls

Weight: 90 kg

Mooring Materials Description

Location of swivels: indicated on diagram

Type of line: 1/2" dual braided nylon

Method of recovery: Lift from surface float

other:

Note:

if meter(s) were deployed in a way other than that of a standard sub-surface mooring, please provide an appropriate description of materials and configuration of the meter(s).

Figure 6. Diagram indicating anchoring and setup of current meters at site. Adapted from diagram courtesy of Ocean Dynamics.

Table 6. Breakdown of sampled current data for the upper depth at 15 meter depth at the Ross Pass site for May 14 to June 12, 2014. Samples were taken every 30 minutes; each sample represents the average over a 2 minute period. The number of samples with speed and direction within ranges centered at the indicated numbers are shown.

Mooring Site: Ross Pass

Time(24h) Date(DMY) Sample# (PST)

Position: Upper

Start: 0:00 14-May-07 1

Deployment Location:

Final: 23:30 12-Jun-07 1440

DGPS:

Latitude: 49 deg 19.521'

Total # of Samples: 1440

Longitude: 126 deg 02.975'

Datum: NAD83

Description: Ross Passage site

Meter Depth: 15 Meters

Bottom/ anchor depth: 33 Meters (corrected to meters below 0 tide)

Instrument: make: Aquadopp

model: AQD current profiler

serial #: 4876

Meter Calibration: May 7, 2008

Records in : Degrees True (Mag. North = 17.2 deg. True)

Sample interval: 30 Minutes

Total # Measurements: 1440 (Sample is instantaneous)

Contact re. deployment: Aquametrix

Contact re. Reporting: IEC

Direction Deg True	Speed (cm/sec)												sum %
	0	3	5	7	10	15	20	30	50	100	150	200	
0	0	9	5	24	26	24	12	0	0	0	0	0	6.9%
15	2	13	11	23	37	35	11	2	0	0	0	0	9.3%
30	4	6	14	17	36	56	25	3	0	0	0	0	11.2%
45	1	3	20	22	36	30	13	0	0	0	0	0	8.7%
60	2	10	11	15	20	11	2	0	0	0	0	0	4.9%
75	0	9	4	12	13	3	1	0	0	0	0	0	2.9%
90	0	5	5	4	8	2	1	0	0	0	0	0	1.7%
105	2	8	5	1	5	0	0	0	0	0	0	0	1.5%
120	0	7	4	5	5	0	0	0	0	0	0	0	1.5%
135	0	9	4	4	3	0	0	0	0	0	0	0	1.4%
150	2	6	5	6	5	0	0	0	0	0	0	0	1.7%
165	2	12	10	6	5	3	0	0	0	0	0	0	2.6%
180	1	6	12	11	13	0	1	0	0	0	0	0	3.1%
195	2	7	10	11	25	12	1	0	0	0	0	0	4.7%
210	0	2	12	11	23	15	0	0	0	0	0	0	4.4%
225	3	13	10	23	31	10	3	0	0	0	0	0	6.5%
240	1	6	12	13	20	13	5	0	0	0	0	0	4.9%
255	1	9	9	20	22	13	6	0	0	0	0	0	5.6%
270	1	7	6	11	13	7	1	0	0	0	0	0	3.2%
285	2	10	10	15	12	2	0	0	0	0	0	0	3.5%
300	1	12	6	6	4	1	0	0	0	0	0	0	2.1%
315	2	2	6	9	5	2	0	0	0	0	0	0	1.8%
330	0	8	6	6	12	3	0	0	0	0	0	0	2.4%
345	2	6	6	14	12	10	2	0	0	0	0	0	3.6%
sum %:	2.2%	12.8%	14.1%	20.1%	27.2%	17.5%	5.8%	0.3%	0.0%	0.0%	0.0%	0.0%	

s.19(1)

Table 7. Breakdown of sampled current data for the bottom depth at 28 meter depth at the Ross Pass site for May 14 to June 12, 2014. Samples were taken every 30 minutes; each sample represents the average over a 2 minute period. The number of samples with speed and direction within ranges centered at the indicated numbers are shown.

Mooring Site: Ross Pass		Time(24h)	Date(DMY)	Sample#	(PST)
Position:	Bottom	Start:	0:00	14-May-07	1
Deployment Location:		Final:	23:30	12-Jun-07	1440
DGPS:	Latitude: 49 deg 19.521'	Total # of Samples:	1440		
	Longitude: 126 deg 02.975'				
	Datum: NAD83				
	Description: Ross Passage site				
Meter Depth:	28 Meters				
Bottom/ anchor depth:	33 Meters (corrected to meters below 0 tide)				
Instrument:	make: Aquadopp				
	model: AQD current profiler				
	serial #: 4876	Meter Calibration:	May 7, 2008		
	Records in : Degrees True	(Mag. North = 17.2 deg. True)			
	Sample Interval: 30 Minutes				
Total # Measurements:	1440	(Sample is instantaneous)			
Contact re. deployment:	Aquametrix	Contact re. Reporting:	IEC		

Direction Deg True	Speed (cm/sec)												sum %
	0	3	5	7	10	15	20	30	50	100	150	200	
0	3	12	13	23	28	11	0	0	0	0	0	0	6.3%
15	5	19	22	24	21	8	0	0	0	0	0	0	6.9%
30	2	10	17	14	6	4	3	0	0	0	0	0	3.9%
45	2	11	15	17	11	1	0	0	0	0	0	0	4.0%
60	1	9	10	4	9	2	0	0	0	0	0	0	2.4%
75	1	15	12	13	5	0	0	0	0	0	0	0	3.2%
90	2	13	7	6	7	1	0	0	0	0	0	0	2.5%
105	2	9	12	8	2	0	1	0	0	0	0	0	2.4%
120	1	9	13	11	6	2	0	0	0	0	0	0	2.9%
135	1	7	11	10	9	1	0	0	0	0	0	0	2.7%
150	3	12	10	11	13	4	0	0	0	0	0	0	3.7%
165	2	11	14	13	11	13	0	0	0	0	0	0	4.4%
180	2	8	9	15	24	13	2	0	0	0	0	0	5.1%
195	4	9	10	14	25	16	3	0	0	0	0	0	5.6%
210	2	12	12	15	18	11	2	0	0	0	0	0	5.0%
225	2	12	15	13	9	4	2	0	0	0	0	0	4.0%
240	0	16	10	11	11	4	0	0	0	0	0	0	3.6%
255	3	17	8	19	5	1	0	0	0	0	0	0	3.7%
270	5	10	18	15	8	1	0	0	0	0	0	0	4.0%
285	3	14	8	9	11	4	0	0	0	0	0	0	3.4%
300	3	19	21	15	16	4	0	0	0	0	0	0	5.4%
315	2	5	17	27	16	4	0	0	0	0	0	0	4.9%
330	2	17	17	16	21	2	0	0	0	0	0	0	5.2%
345	4	11	11	20	17	8	0	0	0	0	0	0	4.9%
sum %:	4.0%	19.9%	21.7%	23.8%	21.5%	8.3%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	

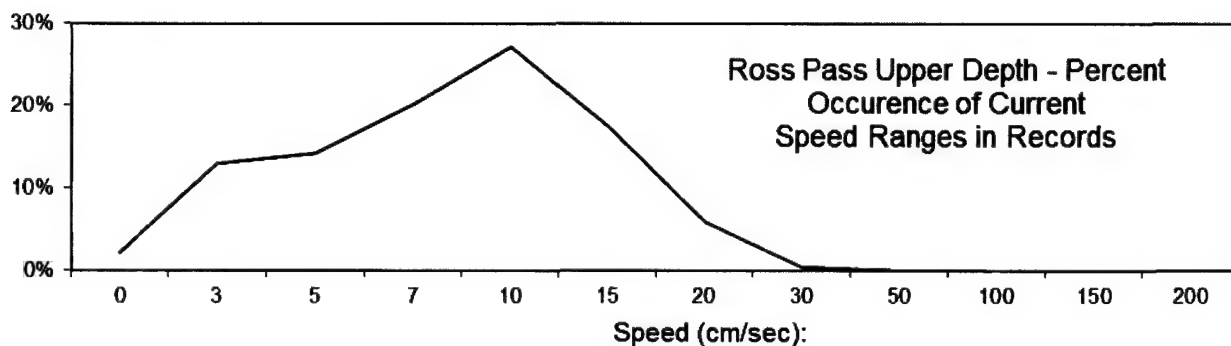


Figure 7. Percent occurrence of current speed for the upper depth 15 meters depth at the Ross Pass Site May 14 to June 12, 2014.

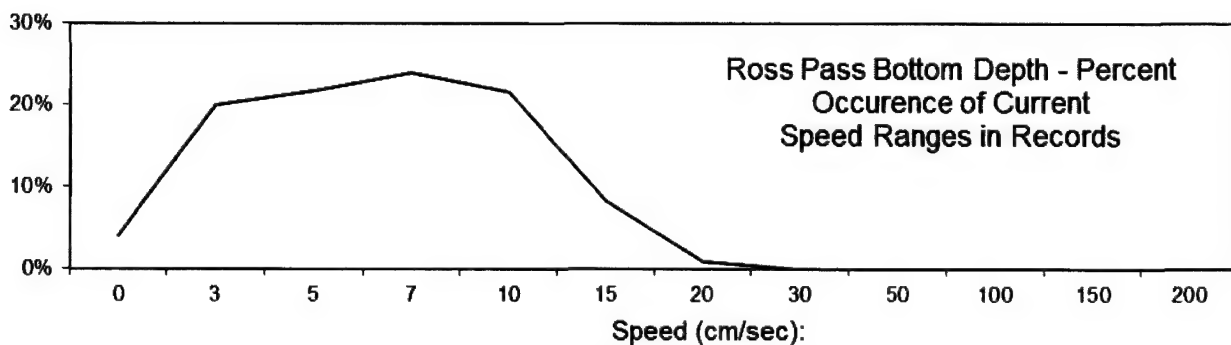


Figure 8. Percent occurrence of current speed for the lower depth at 28 meters at the Ross Pass Site May 14 to June 12, 2014.

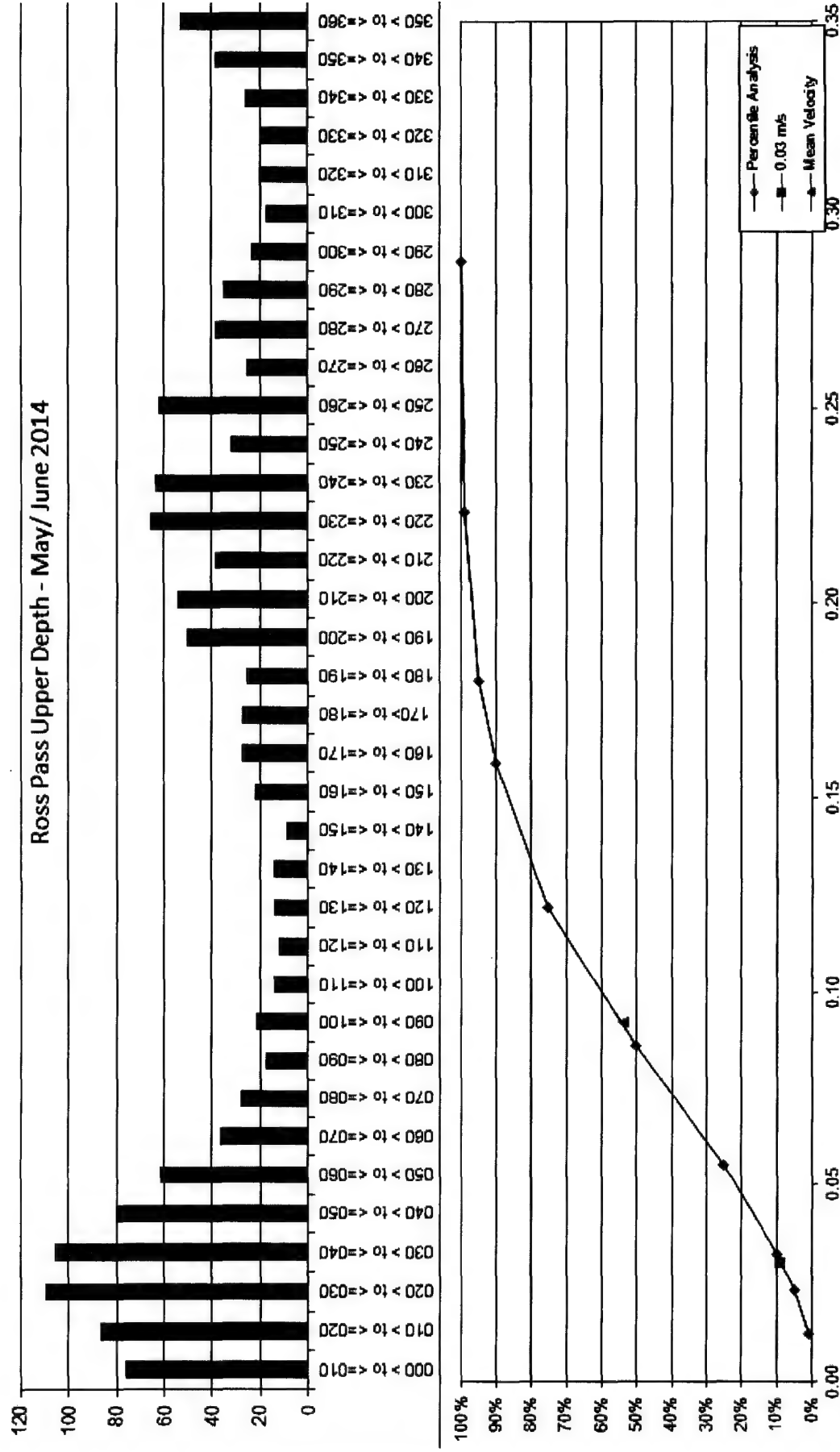


Figure 9. Frequency analysis plots of current direction and speed for the upper depth.

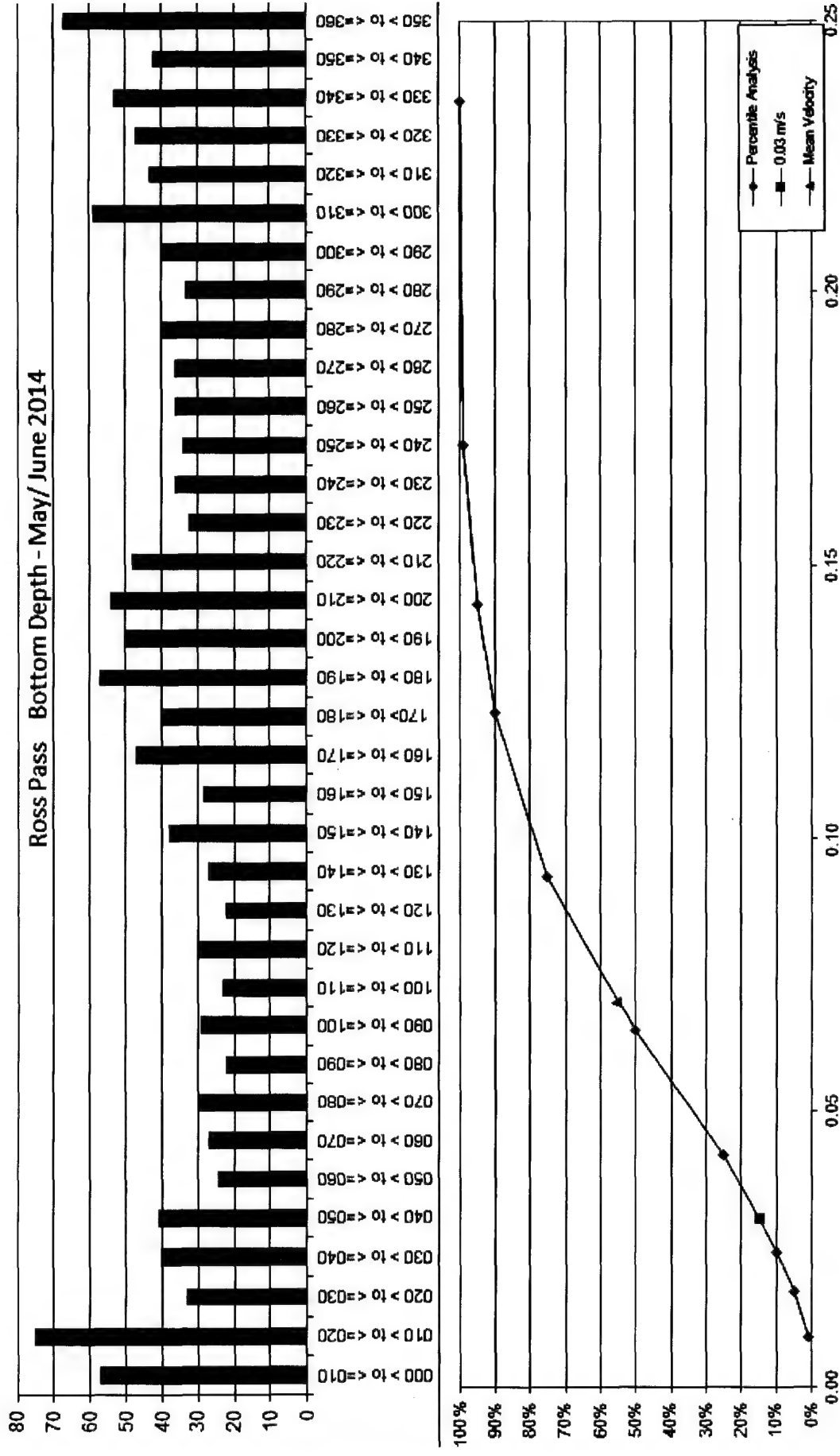


Figure 10. Frequency analysis plots of current direction and speed for the lower depth.

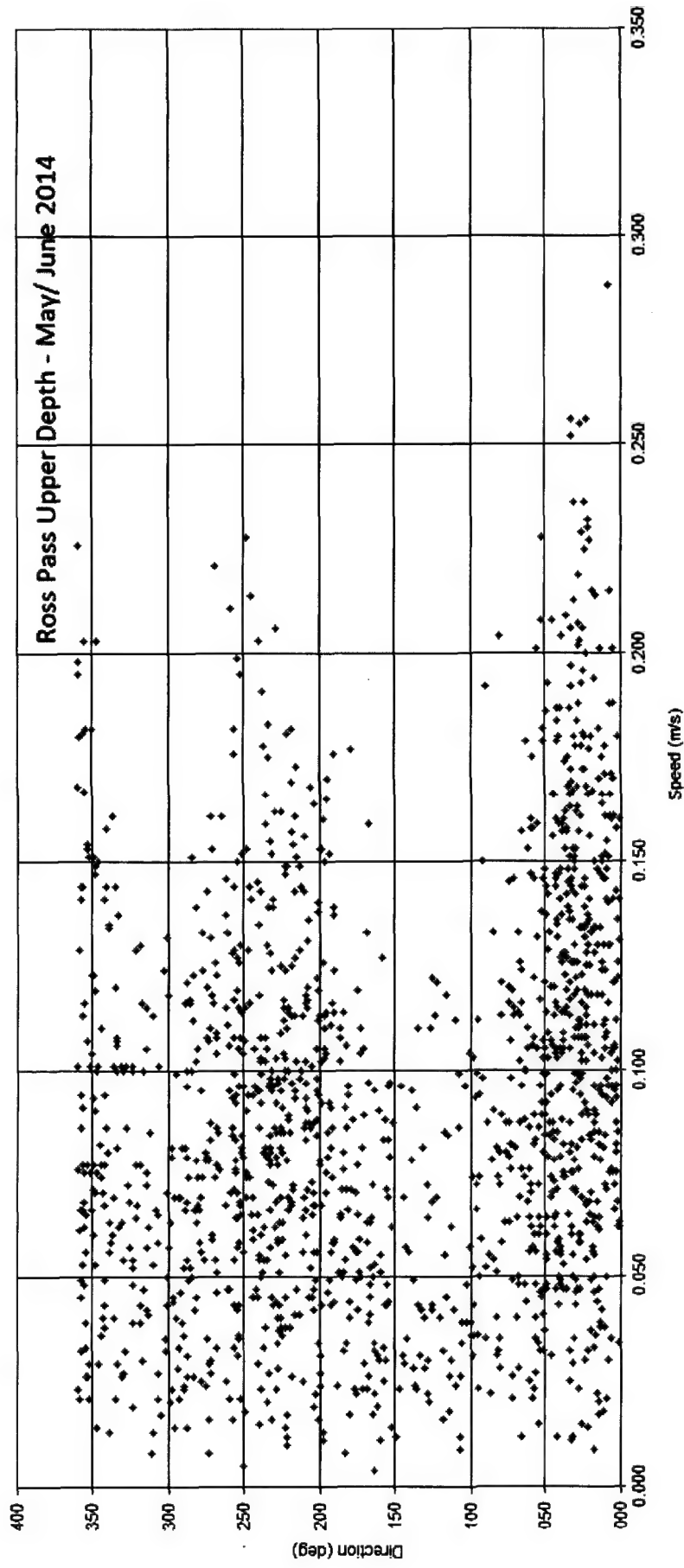


Figure 11. Speed versus direction plots for the upper depth.

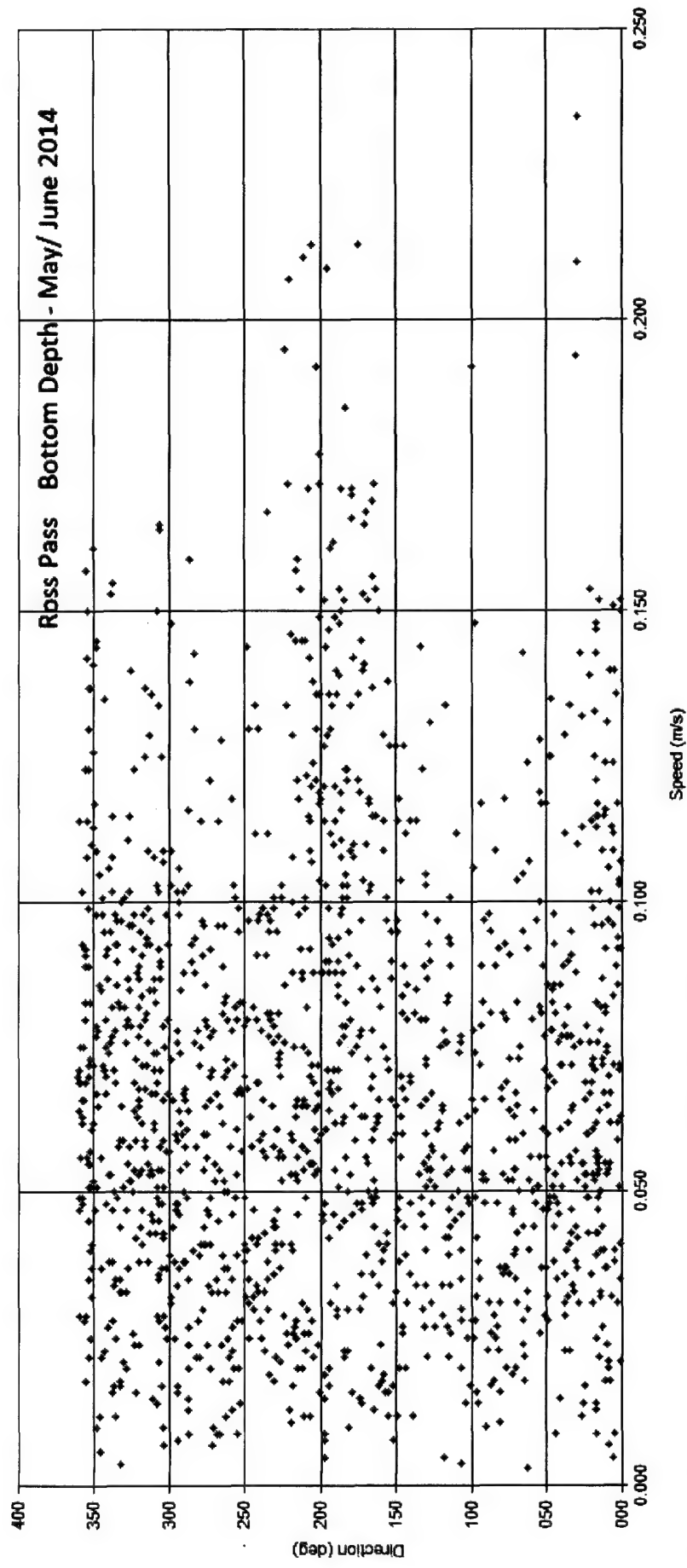


Figure 12. Speed versus direction plot for bottom depth.

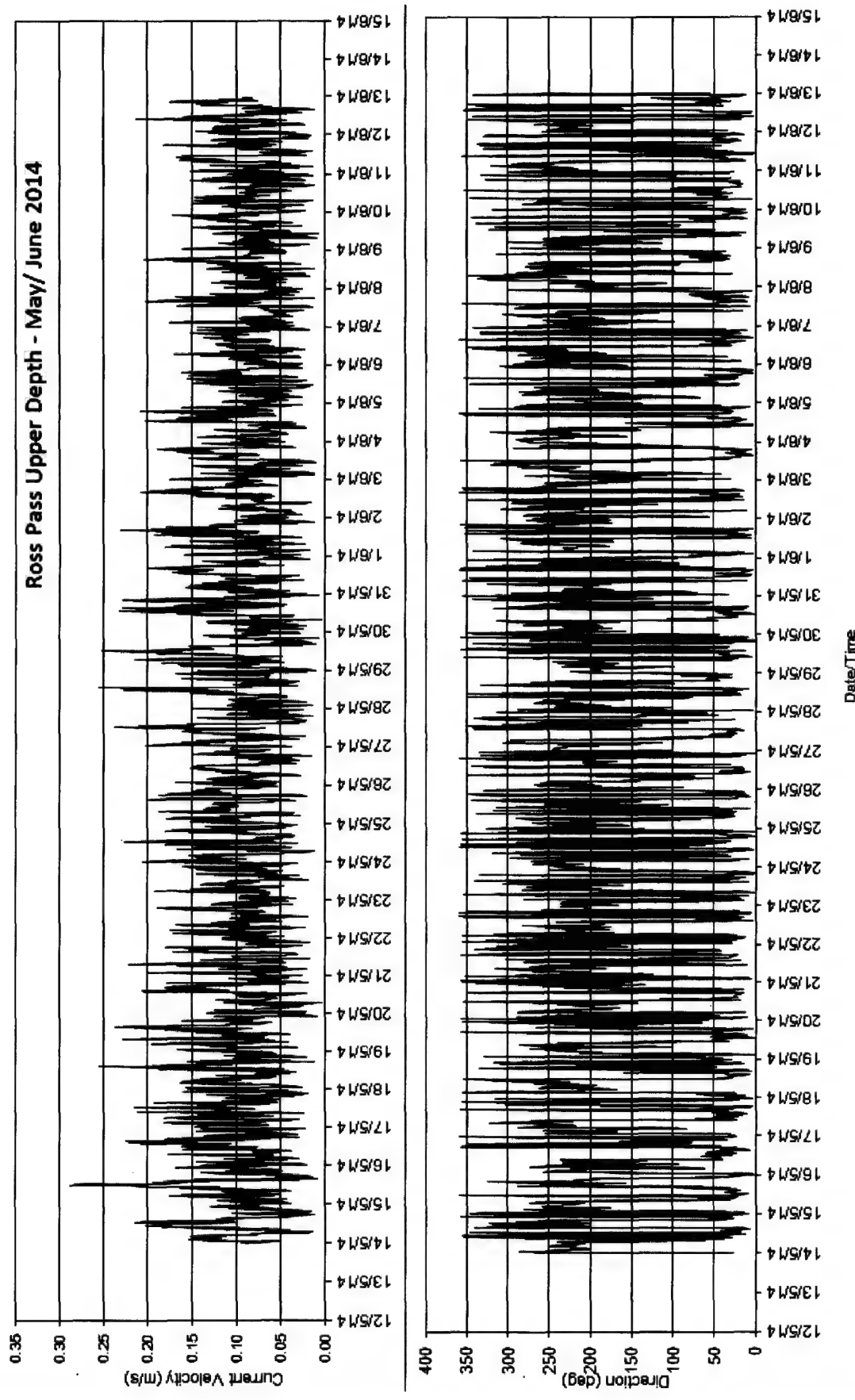


Figure 13. Time series plots of current speed and direction for the upper depth.

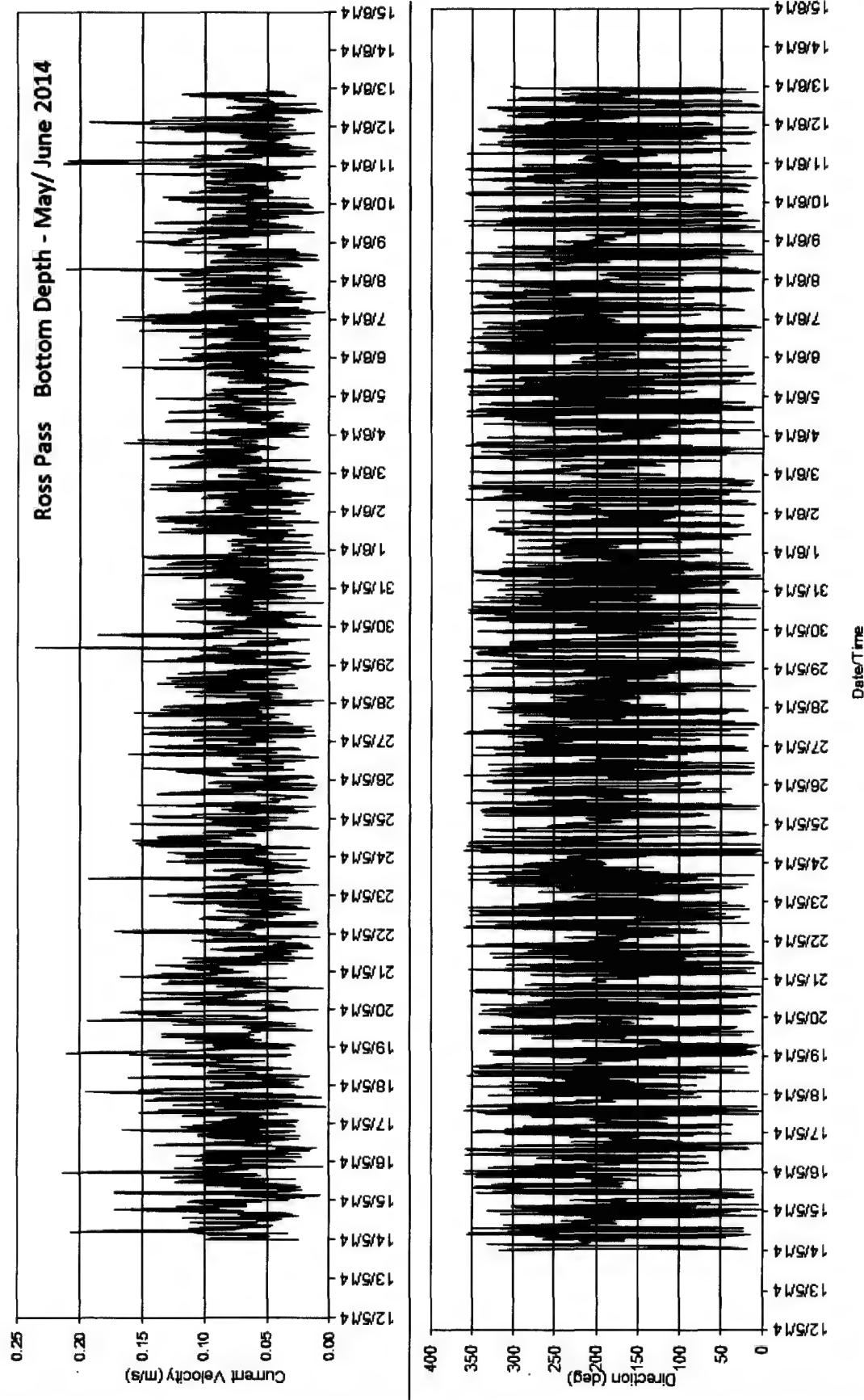


Figure 14. Time series plots of current speed and direction for the bottom depth.

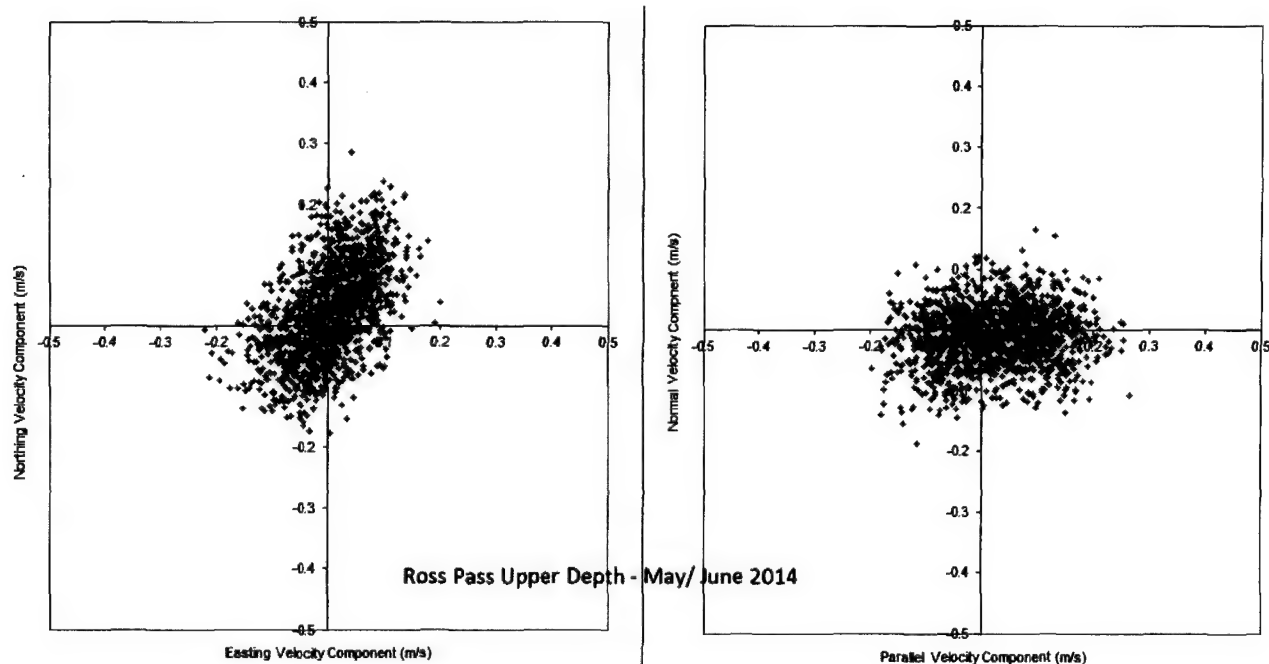


Figure 15. Scatter plots of current speed and directions for the upper depth.

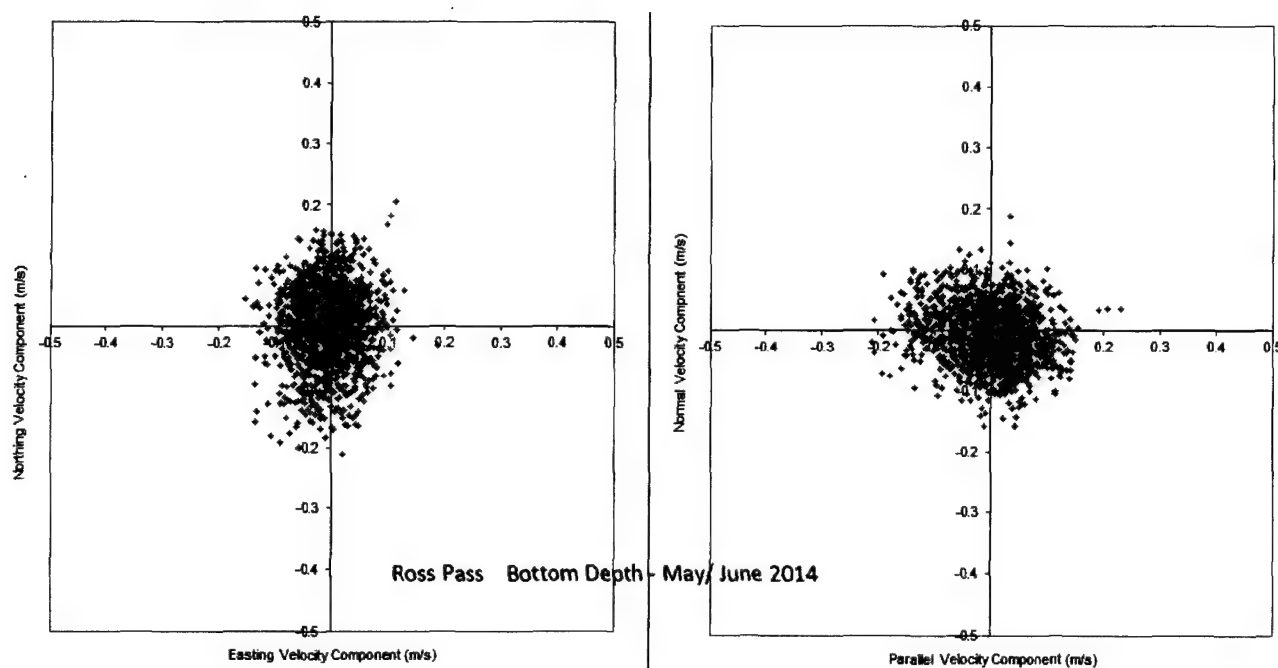


Figure 16. Scatter plots of current speed and directions for the bottom depth.

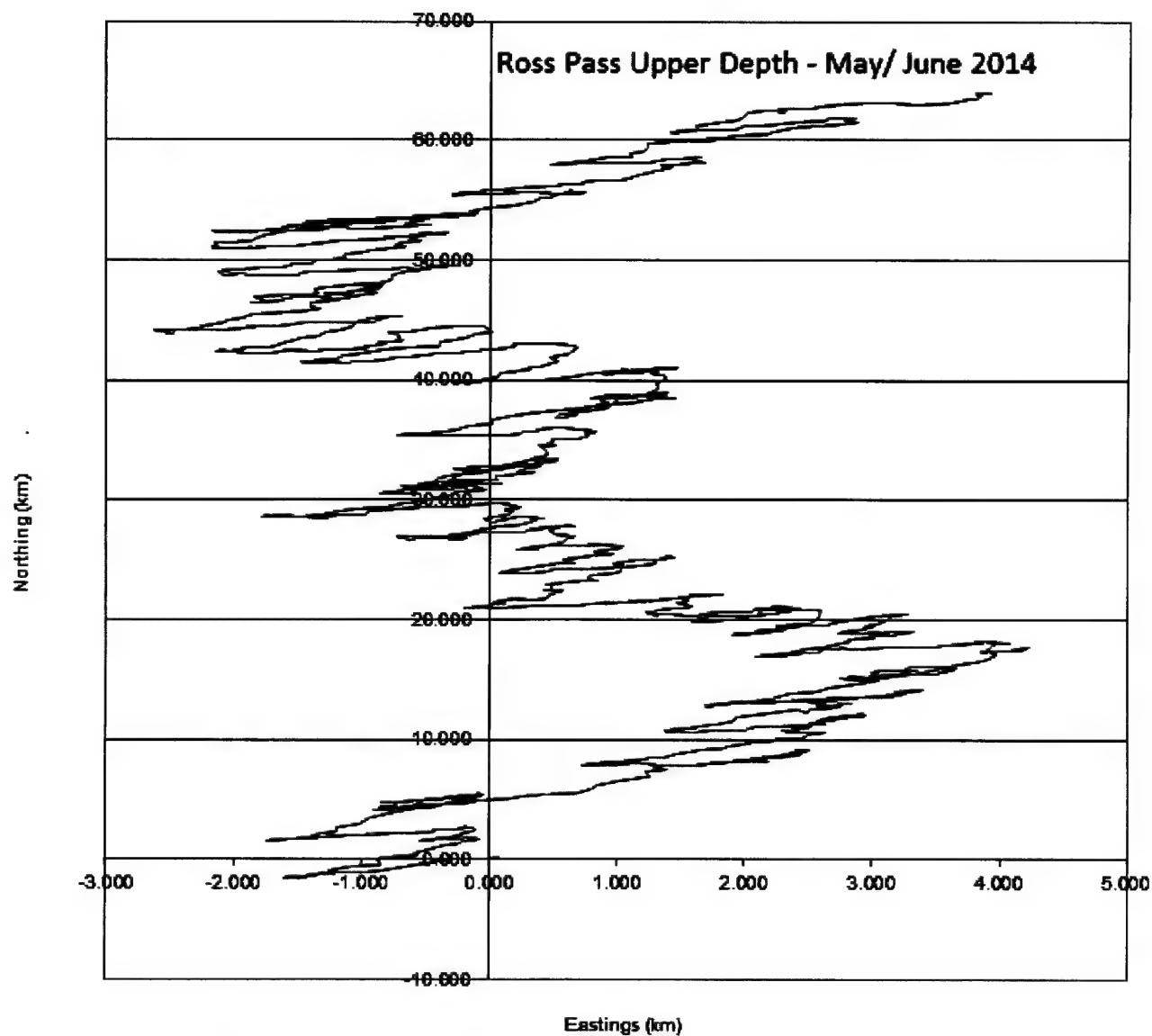


Figure 17. Cumulative vector plot for upper depth.

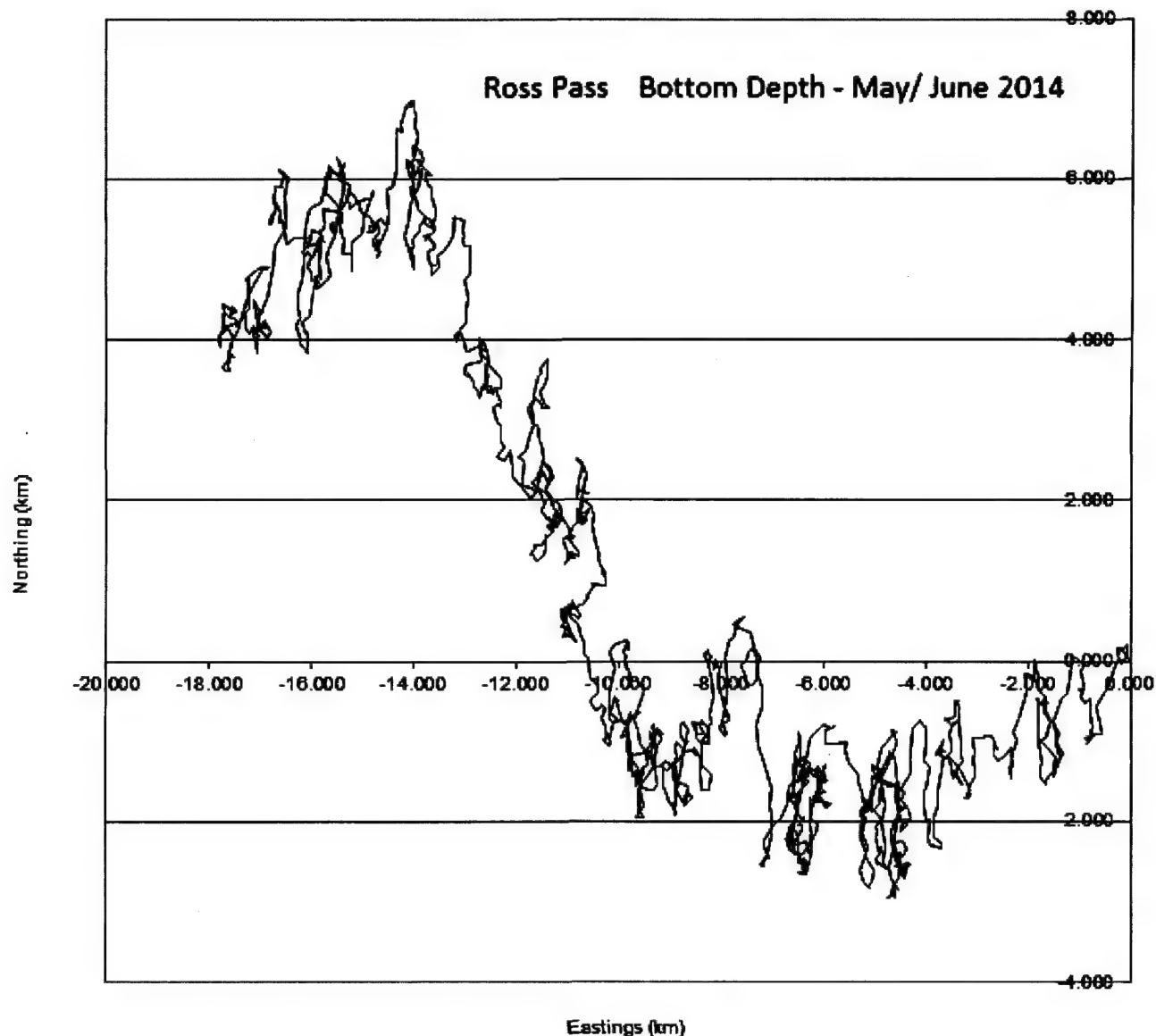


Figure 18. Cumulative vector plot for lower depth.

Contact re. deployment: [redacted] Ocean Dynamics [redacted]

Contact regarding model simulations: [redacted] of IEC at [redacted]

Also contained in appended file: Ross Pass DEPOMOD 2x5 Sept2014.zip

- Raw current data
- DEPOMOD files used in Grid generation, Particle tracking, and Resuspension modules
- Associated shp files for pens and site boundaries.

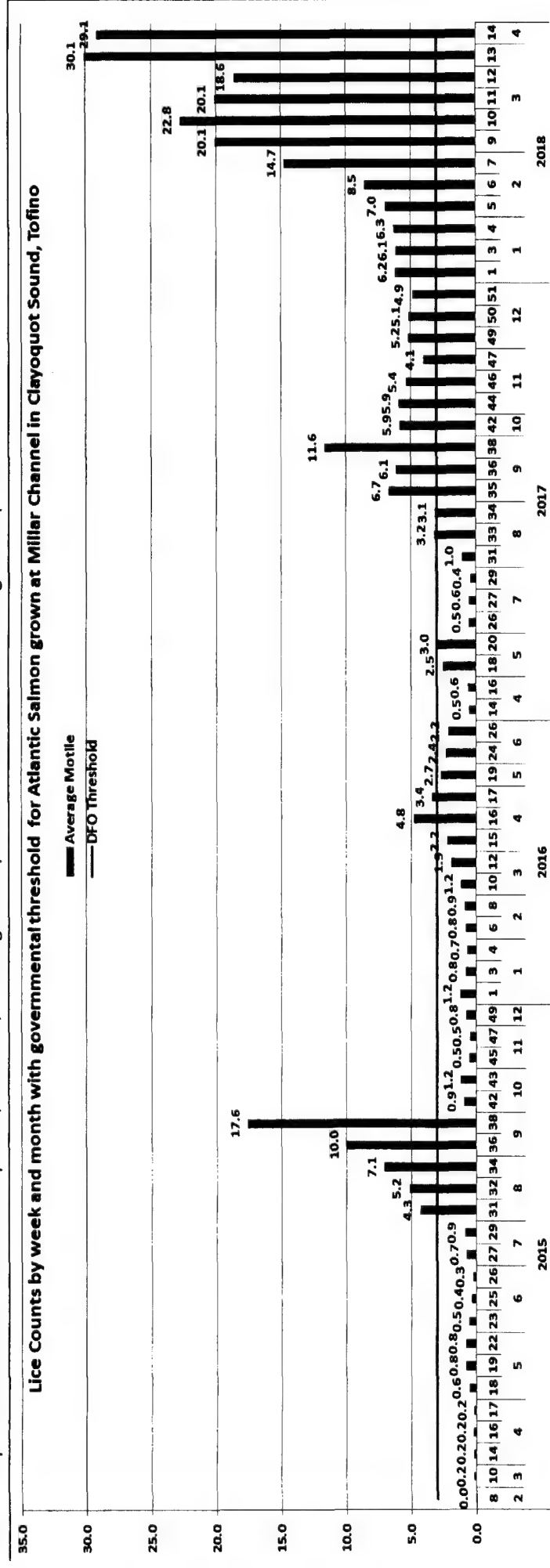
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References:

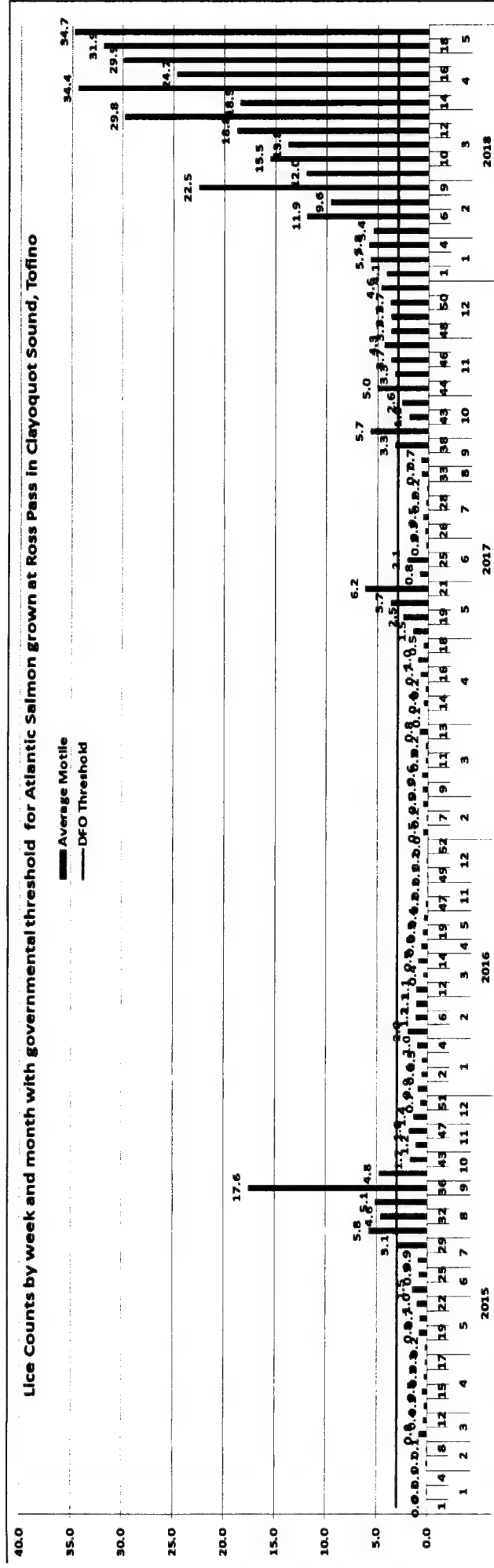
- Cromey, C. J., T. D. Thomas and K. D. Black 2002a. DEPOMOD- modelling the deposition and biological effects of waste solids from marine cage farms. *Aquac.* 214, 211-239.
- Cromey, C. J., T. D. Nickell, K. D. Black, P. G. Provost and C. R. Griffiths 2002b. Validation of Fish Farm Waste Resuspension Model by Use of a Particulate Tracer Discharge from a Point Source in a Coastal Environment. *Estu.* Vol. 25, No. 5, 916-929.

Lice Count Summary;

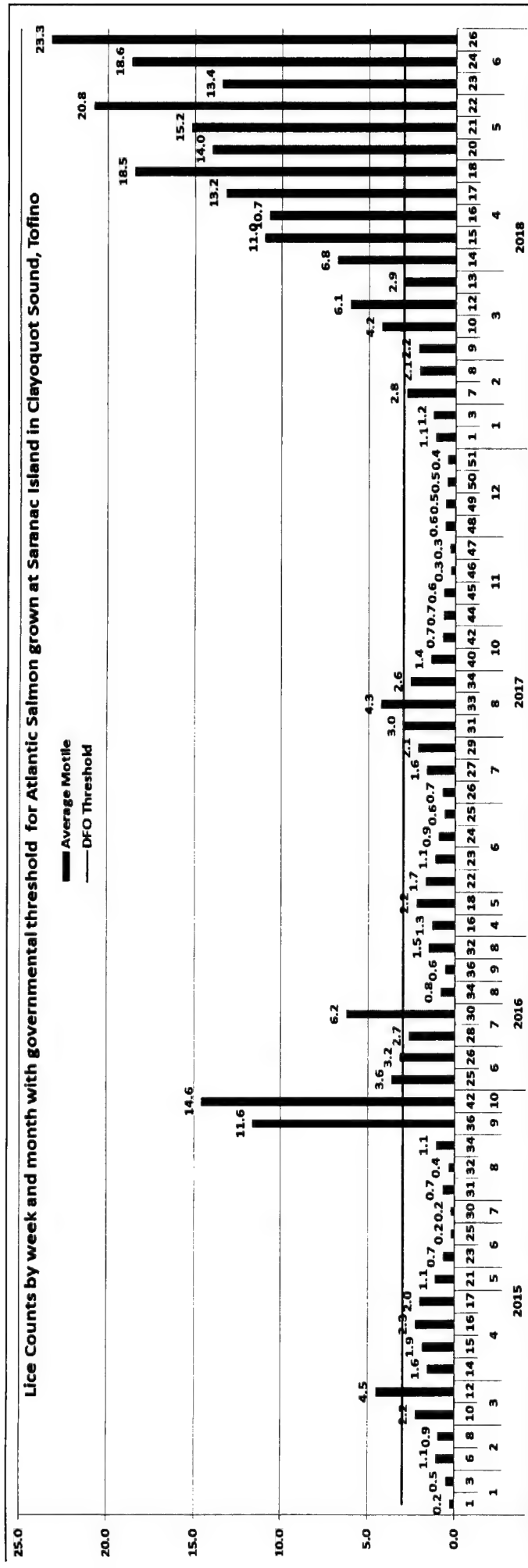
DFO requires a management action within 15 days if a site is over threshold limit during the sensitive period between March 1st and June 30th every year. No immediate action is required outside of the sensitive period, however, a management plan and increased monitoring are required.



The 2015YC at Millar Channel was entered in Dec 2014, harvested out July 2016. The 2017YC was entered in March 2017 from Ross Pass, harvested out April 2018. Treatments occurred in September 2015, April and May of 2016, June 2017 and September 2017 (see treatment summary, Table 1 for details).

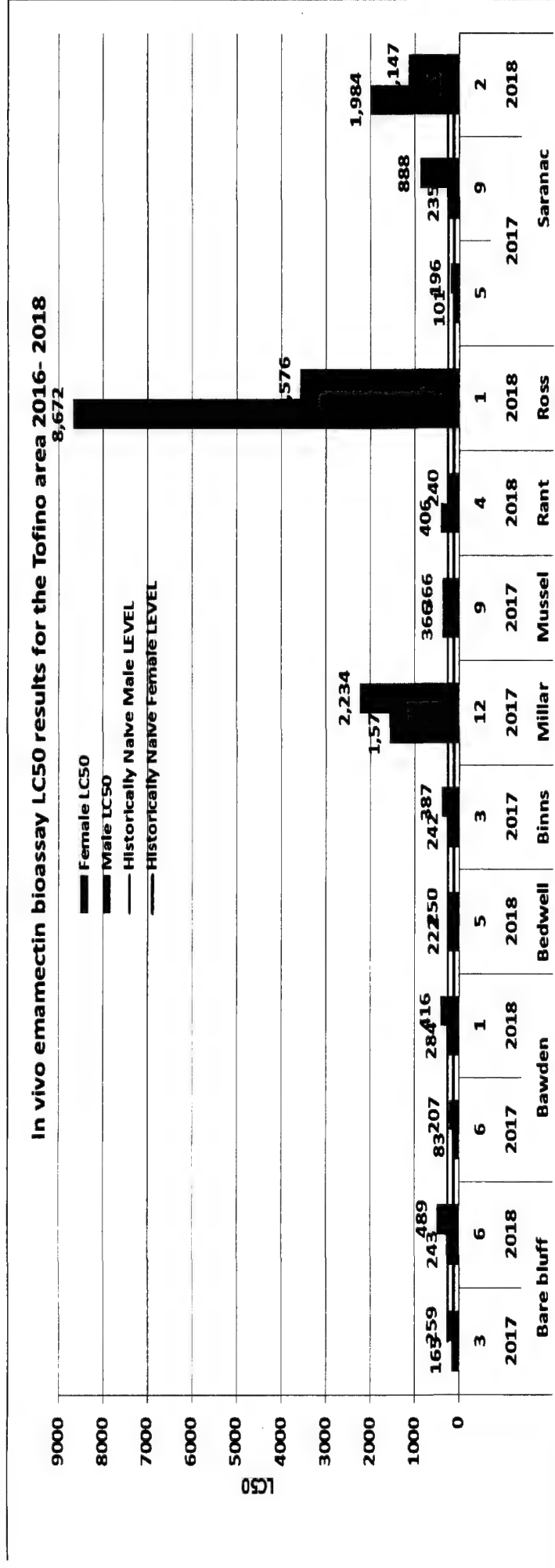


The 2015YC at Ross Pass was entered in Nov 2014, harvested out June 2016. The 2017YC was entered in Sep 2016, harvested out May 2018. Treatments occurred in September/October 2015, February 2016, June 2017 and October 2017 (see treatment summary, Table 1 for details).



The 2014YC at Saranac Island was entered in March 2014, harvested out November 2015. The 2016YC was entered in March 2016 and culled in September 2016 due to let Pen Liver Disease. The 2017YC was entered in April 2017 and is scheduled to be harvested out by August of 2018. Treatments occurred in May 2015, May 2017 and September 2017 (see treatment summary, Table 1 for details).

Bioassay Summary;



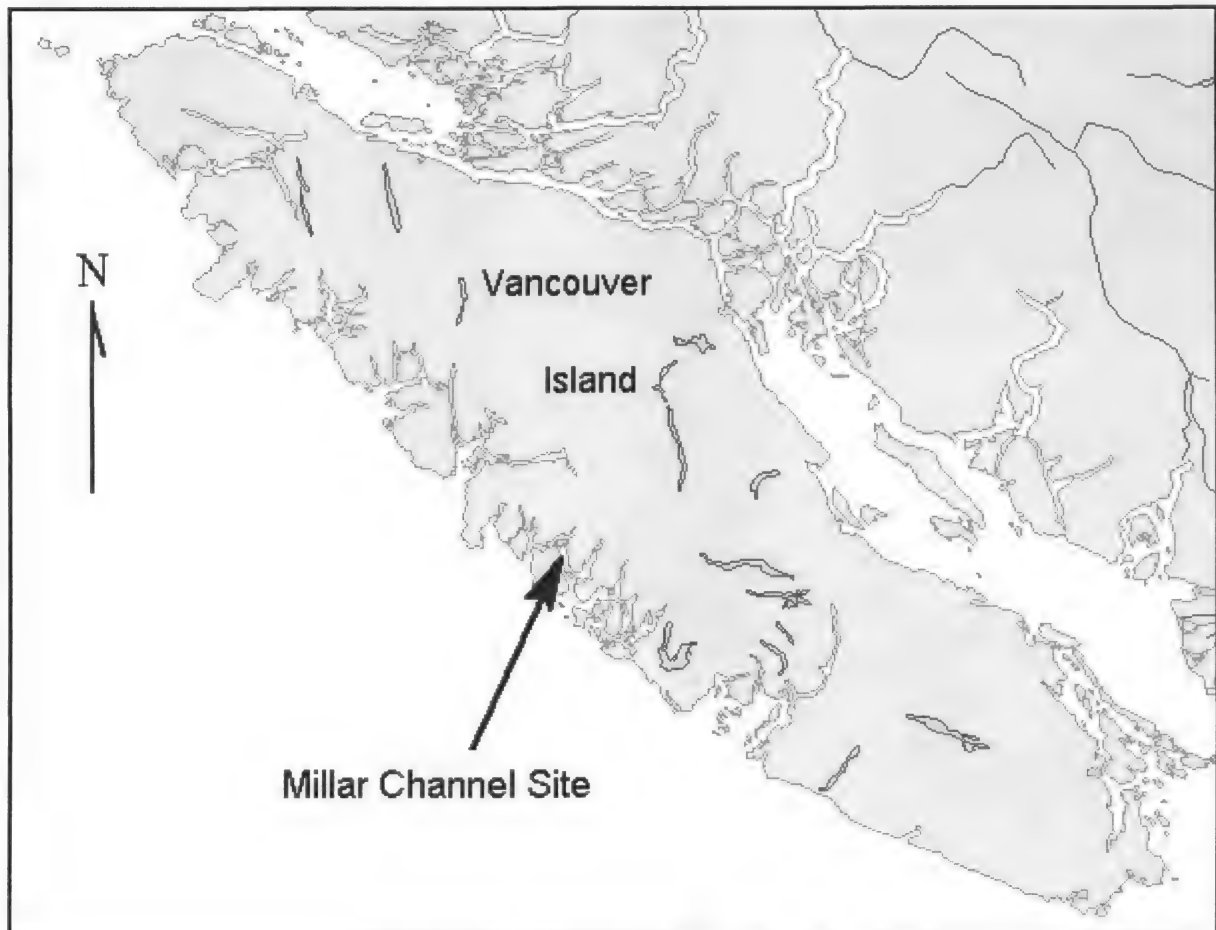
Bioassays are conducted prior to use of emamectin benzoate. Lice are collected on site and transported live to the lab where the in vivo bioassay is completed. A minimum of 30 lice per concentration and sex are used in each assay.

Treatment History;

Table 1. Treatment summary for the last two completed year classes at all three sites.

Start Date	End Date	Site	Year Class	Drug	Diagnosis	# Days	Feed Size	Prescription #	Year	Month (End of Tx)	Quarter	Feed Quantity (kg)	Inclusion rate per tonne (g)	Active Ingredient (kg)
02-May-15	10-May-15	Saranac	2014	Emamectin Benzoate	Sea Lice	7	XL	15-40	2015	5	2	78,000	8.24	0.643
21-Sep-15	30-Sep-15	Millar	2015	Emamectin Benzoate	Sea Lice	7	L	15-88	2015	9	3	52,000	7.68	0.399
30-Sep-15	06-Oct-15	Ross	2015	Emamectin Benzoate	Sea Lice	7	L	15-90	2015	10	4	46,000	8.89	0.409
21-Feb-16	27-Feb-16	Ross	2015	Emamectin Benzoate	Sea Lice	7	XL	016-031BM	2016	2	1	47,880	14.30	0.685
21-Apr-16	29-Apr-16	Millar	2015	Emamectin Benzoate	Sea Lice	9	XL	016-046bBM	2016	4	2	21,000	12.50	0.263
12-May-16	18-May-16	Millar	2015	Emamectin Benzoate	Sea Lice	7	XL	016-046cBM	2016	5	2	21,700	12.50	0.271
20-May-16	27-May-16	Millar	2015	Emamectin Benzoate	Sea Lice	8	XL	016-046dBM	2016	5	2	21,910	12.50	0.274
21-Jul-16	27-Jul-16	Saranac	2016	Emamectin Benzoate	Sea Lice	7	4.5mm	016-074BM	2016	7	3	12,075	5.00	0.060
13-May-17	20-May-17	Saranac	2017	Emamectin Benzoate	Sea Lice	7	4.5mm	017-078BM	2017	5	2	37,100	5.60	0.208
2-Jun-17	8-Jun-17	Millar	2017	Emamectin Benzoate	Sea Lice	7	6.5mm	017-082BM	2017	6	2	49,840	5.00	0.249
2-Jun-17	9-Jun-17	Ross	2017	Emamectin Benzoate	Sea Lice	7	6.5mm	017-083BM	2017	6	2	45,570	5.00	0.228
16-Sep-17	22-Sep-17	Saranac	2017	Emamectin Benzoate	Sea Lice	7	L	017-119BM	2017	9	3	75,250	7.10	0.534
21-Sep-17	27-Sep-17	Millar	2017	Emamectin Benzoate	Sea Lice	7	L	017-121BM	2017	9	3	78,540	6.30	0.495
1-Oct-17	7-Oct-17	Ross	2017	Emamectin Benzoate	Sea Lice	7	L	017-137BM	2017	10	4	47,390	7.70	0.365

DEPOMOD Documentation for
Mainstream Canada Millar Channel Site
Clayoquot Sound
2 x 6 Pen Configuration
(30 x 30 x 15 meter pens)



November 12, 2012

1.0 DEPOMOD prediction of waste distribution

DEPOMOD (DEPOMOD v 2.2 Jan. 2001;) was used to predict the distribution of wastes at the Millar Channel site (2x6 pen configuration; Figure 1) for Mainstream Canada. DEPOMOD is a model developed in Scotland (Cromey *et al*, 2002a) to assist in location of fish farms and in the regulatory process by predicting the waste accumulation on the seabed arising from fish farms.

DEPOMOD uses local currents, bathymetry, pen location and size and feed quantities to predict the extent of distribution or “footprint” of the farm wastes as total solids or as organic carbon calculated over a period of time or as fluxes (fluxes were predicted for the Millar Channel site for maximum and average feed). Information on the models and field validation are presented by Cromey *et al* (2002a and b).

The model consists of a series of modules or sub-models

- A grid development module with depth/ pen, etc. location
- a particle tracking model
- a resuspension/organic decay module (resuspension was not used)
- a semi-empirical benthic impact module (not used)

It has been noted that aspects requiring further investigation include application of the model at depths greater than about 70 meters and areas and/or with steep depth gradient (C. Cromey at BCARDC Workshop on Wastes, Nov. 25&26, 2003). The model is undergoing validation in BC conditions. Modeling has been undertaken by IEC to the best of our ability using supplied data and information and DEPOMOD Version 2.2. It should be noted that the results are estimates only and subject to the above conditions and limitations.

Current meters were deployed at the site and collected data September 24 to November 19, 2012. Modeling using DEPOMOD has been undertaken in November, 2012 using the first 30 days of current data and reported in the present document.

For the Millar Channel site, Table 1 presents inputs used for DEPOMOD, Figure 1 indicates the grid area used in the model and Figures 2 and 3 present the flux predictions without resuspension for the period of maximum feed input and for average feed input. Surface areas of various contour levels (grams of carbon per square meter per day) of predicted footprint based on maximum and average feeding are shown in Table 2. Mass balance calculations to determine the quantity and percent of waste material that were predicted to be deposited within the model area are included in Table 3. Hydrographic information is summarized in Section 2 below.

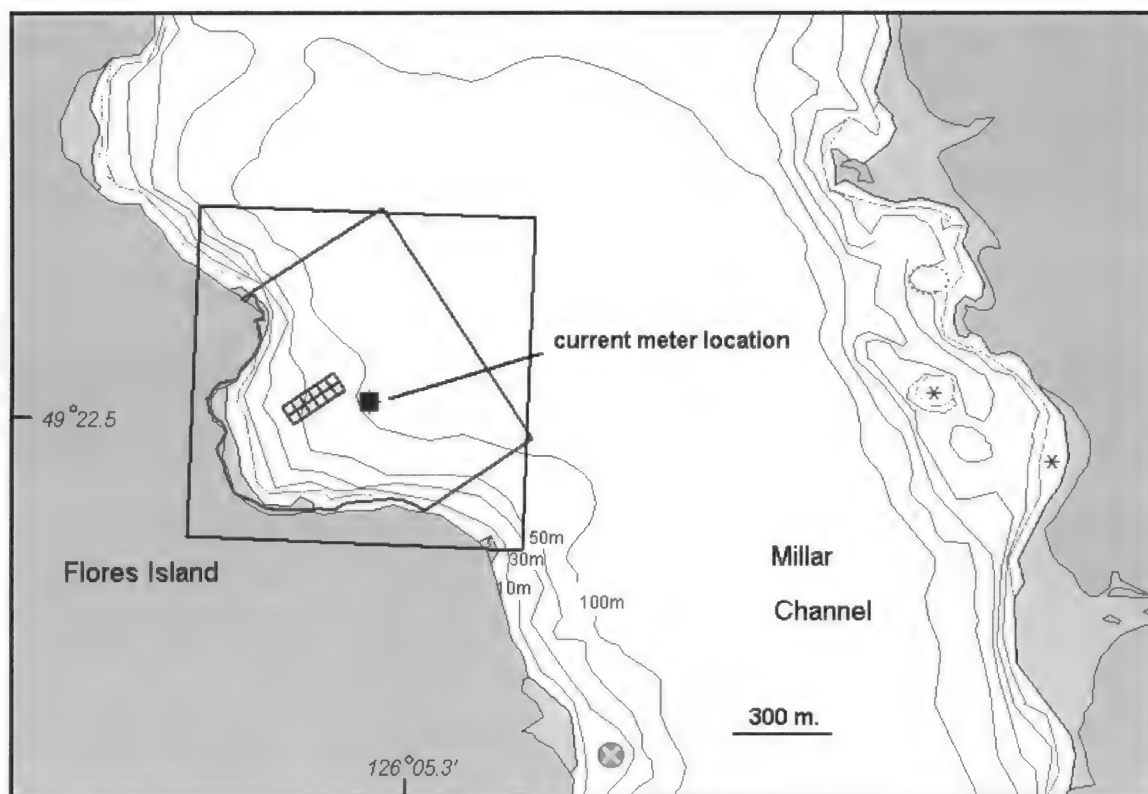


Figure 1. Diagram indicating 1000 by 1000 meter grid area used in DEPOMOD (black) at the Millar Channel site, tenure boundary (blue), pen location (blue) and current meter location.

Table 1. Site and input factors used with DEPOMOD for prediction of probable footprint at the Mainstream Canada Millar Channel site November, 2012 (2x6; 30m pens).

Site Name:	Miller Channel
Company:	Mainstream Canada
Location:	49 deg 22.5' 126 deg 05.5'
Land File #:	1408719
Pens	
Number and type of Cages	12 square pens
Dimensions of net cages (m)	Pen Length: - 30m Pen Width - 30m Pen Depth: - 15m
Groups of net cages and orientation	2 rows of 6 pens at 056 Deg T along length
Longitudinal spacing between cage centres (m):	32m Distance
Transverse spacing between cage centres (m):	33m
Surface area of cages (m²)	~900*12=10,800 m ²
Coordinates of first cage centre by group (UTM or lat/long):	49 deg 22.513' 126 deg 05.589' 49 deg 22.498' 126 deg 05.574'
Feed and Grow-out	
Maximum Daily Feeding Rate (kg/day):	Feed input/pen at peak feed volume: 880kg/day @ 15 months
Average Daily Feeding Rate over the grow-out period (kg/day):	Average feed input/pen: 460 kg/day
Total feed budget for grow-out period (tonnes)	3,076 tonnes
Approx. Farm production	
Duration of grow-out period (months)	
Hydrographic:	
Current meter mooring location (UTM or lat/long):	49 deg 22.524' 126 deg 05.390' NAD83
Height of Mean Water Level above chart datum (m)	2.15 m (Riley Cove)
Depth at cage group position	45 to 95 m (from bathymetry depth)
Number of current velocity data sets used	3
Heights of mooring above sea bed	5, 56 & 96 m
Depth of water column at mooring	111 m
Length of current velocity record	30 days
Sampling interval (mins)	30 min converted to hourly with DFO-provided tool (courtesy Jon Chamberlain)
Time step of data used in model	60 min
Total number of time steps used in model	720
Mooring position	85meters at 114 degrees from the E corner of pens

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Table 1 Contd.

Bathymetry from	<ul style="list-style-type: none"> From bathymetry provided as 25m grid by Ocean Dynamics Canada Ltd. and Coast Spatial GIS & Mapping Specialists. (The DGPS receiver used for the bathymetric survey is a Trimble Pro XRB; sonar is a high end Lowrance X-15 with custom software supplied by Lowrance and a custom transducer capable of 2400 feet in salt water; boat speed of 1 - 2.5 meters/second yields a maximum distance of 4 to 5 meters between soundings; transects are generally 10 meters apart within the actual lease boundary and 15 meters apart outside the boundary; 2004 info; areas outside boundaries may be supplemented by CHS data as necessar)
Modeling:	
Area	– x = 1000m; y = 1000m
Grid Origin	– 710709E 5472838 UTM9 NAD83
Major Grid/ Minor Grid sizes	– 25x25m/ 10x10m
Food water content	– 10%
Digestibility of feed	– 90%
% Carbon in feed	– 57%
% Carbon in faeces	– 33%
Food wasted as % of food fed	– 3%
Food particle settling velocity distribution	– 11.0cm/s
Faecal particle settling velocity distribution	– 3.2cm/s SD 1.1 cm/s
Turbulence Model	– Random Walk
Horizontal dispersion coefficients	– 0.1 m ² ./s
Vertical dispersion coefficient	– 0.001 m ² ./s
Trajectory evaluation accuracy	– High 60s
Number of particles used	– 10
Resuspension Model/ Options	– OFF
Other Models	– Not used
Output	– Flux (grams C/m ² /year; calc. to /day)

Contact regarding model simulations

– IEC

s.19(1)

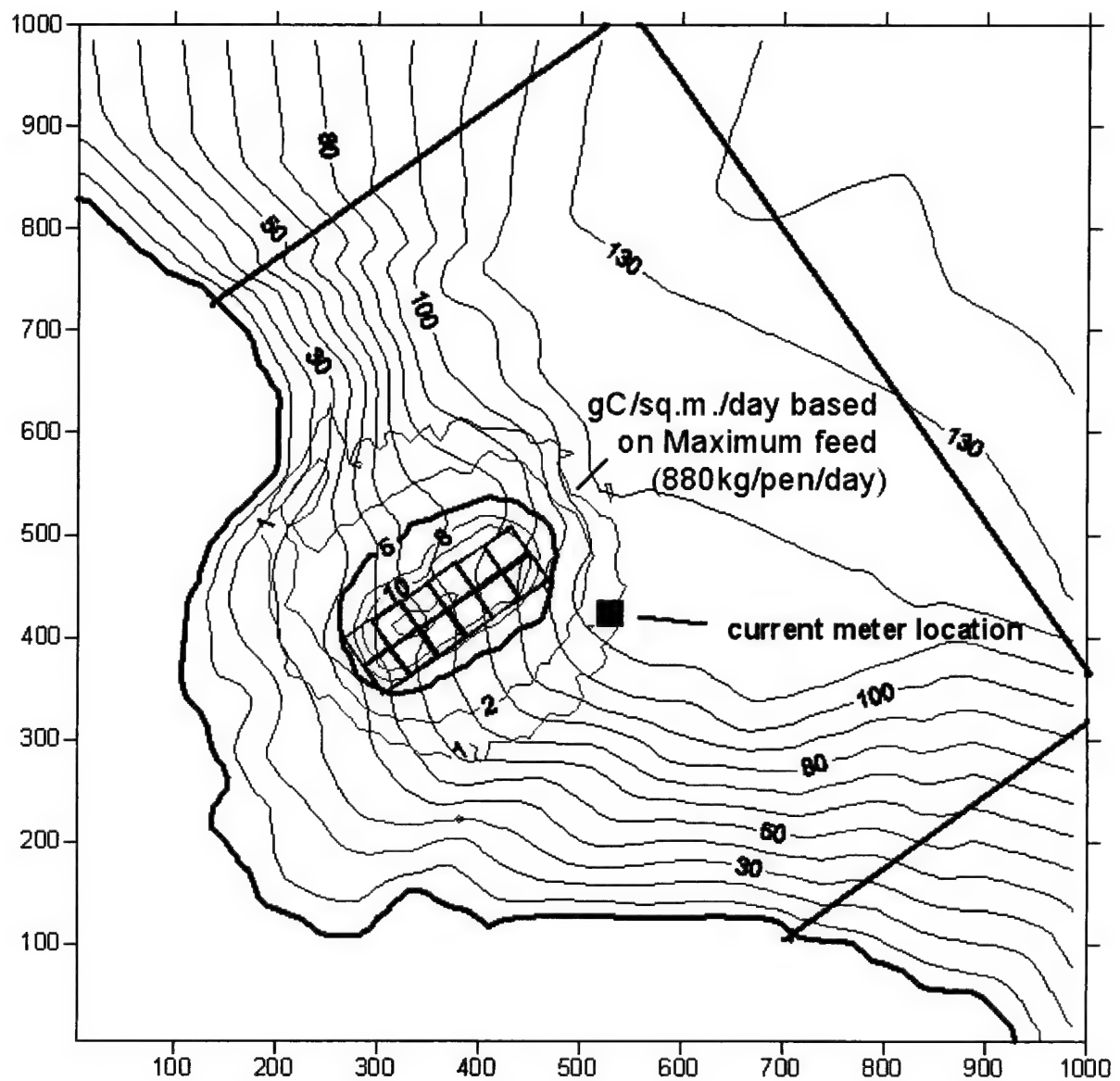
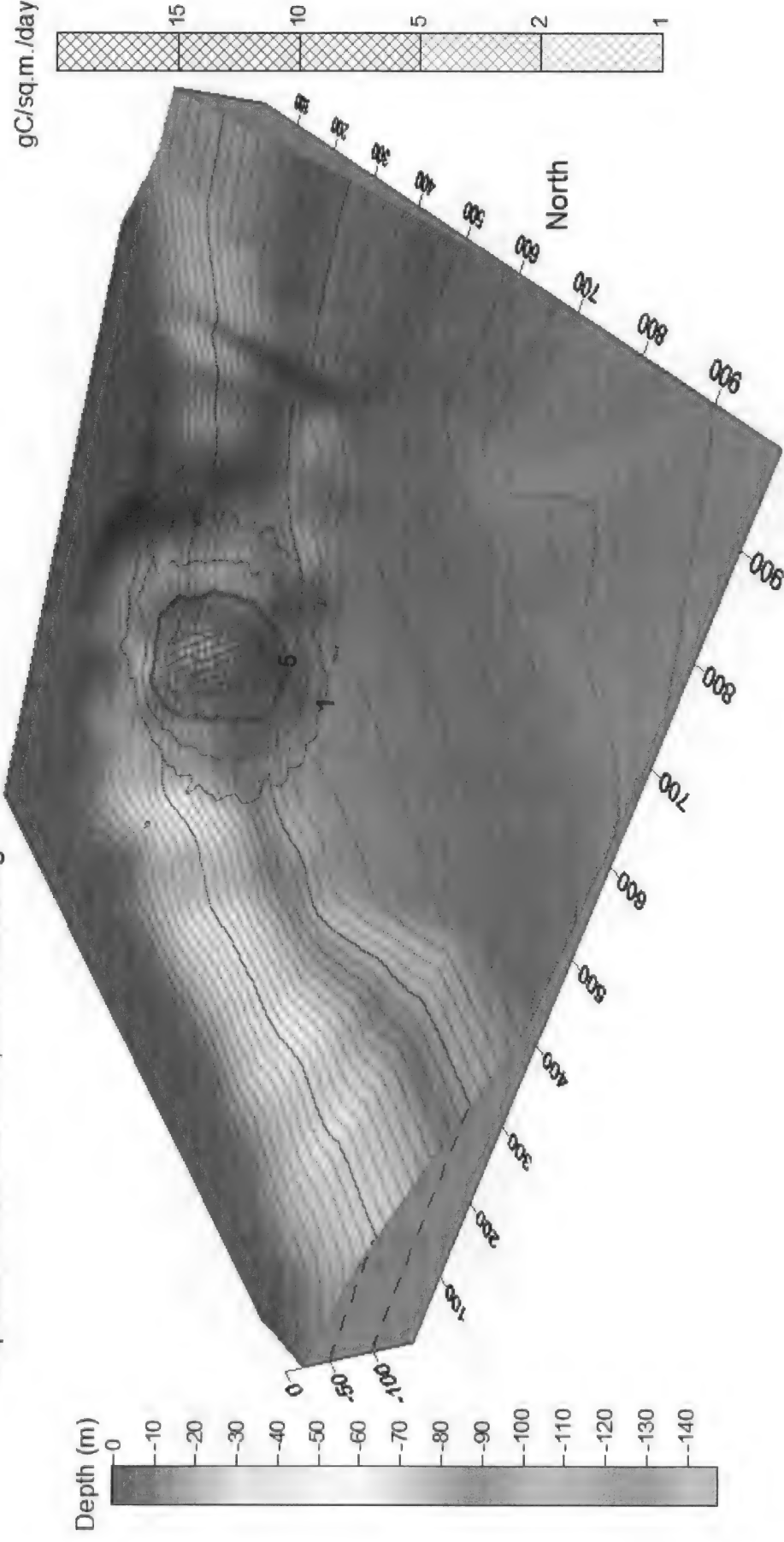


Figure 2. DEPOMOD predicted footprint contours based on maximum feeding. Pen centers are boxes; heavy blue lines are boundaries. Blue contour lines are depths in meters.

Millar - 2 x 6 array of 30m cages
Based on Maximum Feed (880 kg/pen/day)
Depomod: November 12, 2012 modeling



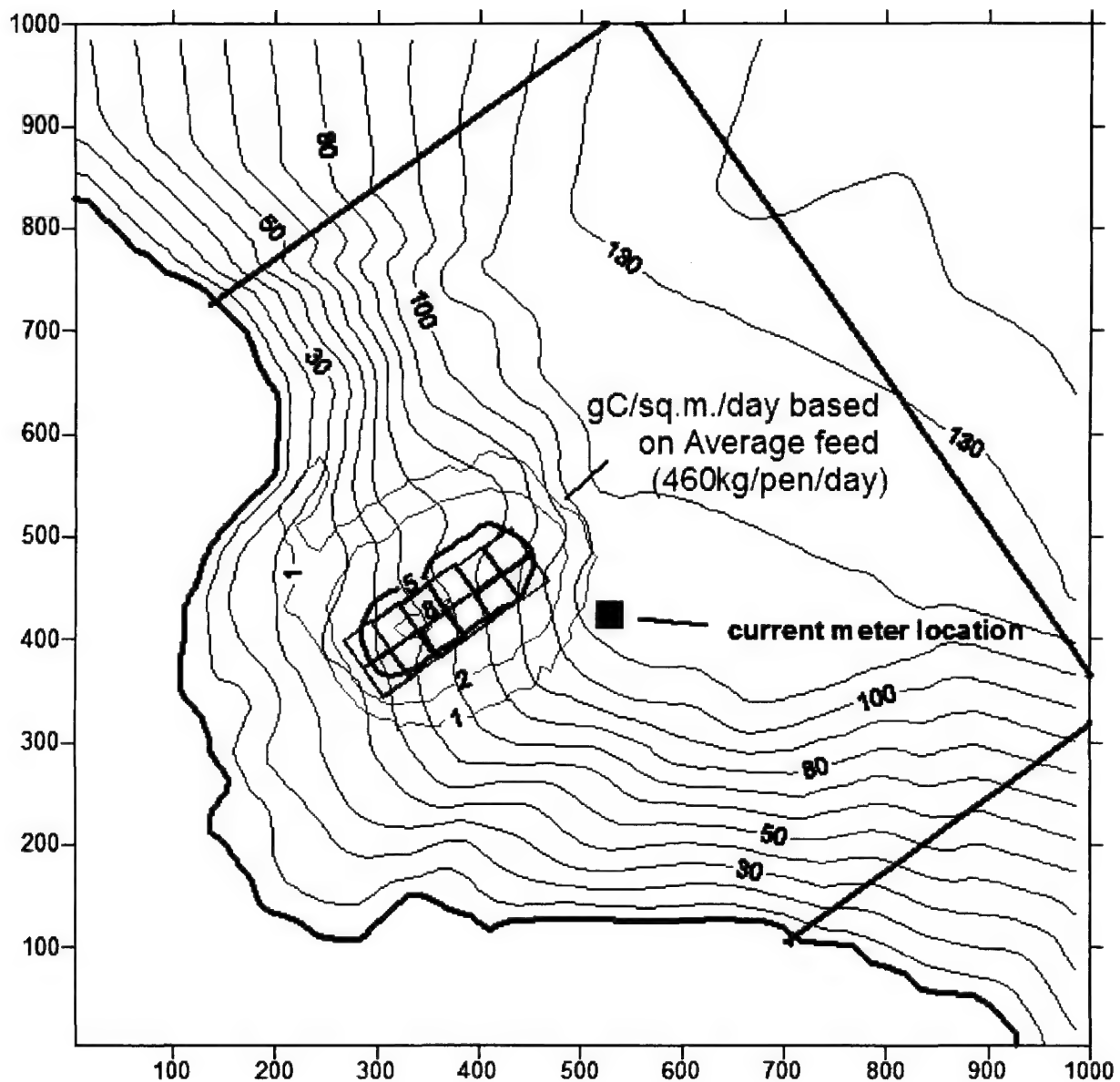


Figure 3. DEPOMOD predicted footprint contours based on average feeding. Pen centers are boxes; heavy blue lines are boundaries. Blue contour lines are depths in meters.

Millar - 2 x 6 array of 30m cages
Based on Average Feed (460 kg/pen/day)
Depomod: November 12, 2012 modeling

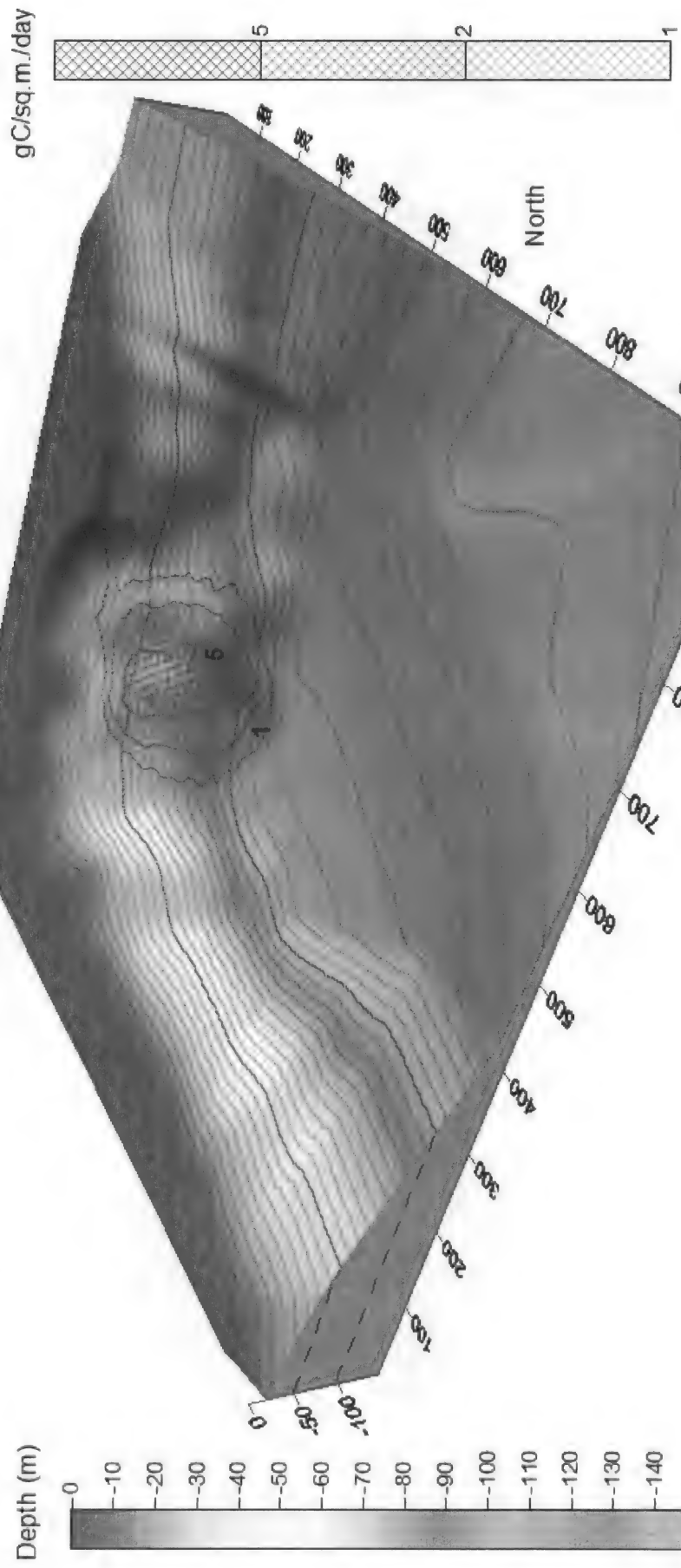


Table 2. Surface area of predicted footprints contours based on maximum (above) and average (lower) feeding

No Resuspension	
Maximum Feed gC/sq.m./dqy	Surfer Positive Planar Area [cut] (sq.m.)
1	89,642
2	55,356
5	28,038
8	17,178
10	12,058
15	954
20	0

No Resuspension	
Average Feed gC/sq.m./dqy	Surfer Positive Planar Area [cut] (sq.m.)
1	57,247
2	34,388
5	13,183
8	587
10	0

Table 3. Mass balance calculations for the Millar Channel site to determine the quantity and percent of material deposited within the model area based on maximum (upper) and average (lower) feeding. (method used as in DCP150 - DFO Marine Fish Habitat Information Requirements for Finfish Aquaculture Projects).

<u>Maximum feed</u>	
Surfer Positive Volume [cut] value/day in grid area	<u>No Resuspension</u> 465,984 g C
# pens	12
feed per pen/day/pen (kg)	880 kg
or	880,000 g
total feed, all pens	10,560,000 g
X	0.044
feed X 0.044 (C calc. as in method)	464,640 g C
C deposited in grid area as % of expected from feed	100.3%

<u>Average feed</u>	
Surfer Positive Volume [cut] value/day in grid area	<u>No Resuspension</u> 243,583 g C
# pens	12
feed per pen/day/pen (kg)	460 kg
or	460,000 g
total feed, all pens	5,520,000 g
X	0.044
feed X 0.044 (C calc. as in method)	242,880 g C
C deposited in grid area as % of expected from feed	100.3%

2.0 Hydrographic Data

Information about the current meters and their location and deployment is presented in Table 4.

Table 4. Current meter deployment information.

Equipment

Meter(s):	<ul style="list-style-type: none"> - Nortek Aquadopp Current Profiler: Aquapro 400khz (see Figure 4 for specification sheet) - Serial Number: AQD5108/ AQD5115 - Last calibration and servicing – n/a
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Current Meter Deployment

Meter location:	<ul style="list-style-type: none"> - Mainstream Canada Millar Channel site at a location 85meters at 114 degrees from the E-most corner of pens - 49 deg 22.524' 126 deg 05.390' NAD83; see Figure 5).
Magnetic declination	<ul style="list-style-type: none"> - For the site, Magnetic North = 17.8 degrees True
Depth at location:	<ul style="list-style-type: none"> - 111 meters
Tidal range:	<ul style="list-style-type: none"> - 4.37 meters based on Riley Cove current station
Mean Water Level:	<ul style="list-style-type: none"> - 2.15 meters
Meter recording Depths:	<ul style="list-style-type: none"> - surface (15meter depth) - midwater (56m; at mid water depth for site greater than 50 meters in depth); and - near-bottom (5 meters above the sea floor at 96 meters depth)
Record type:	<ul style="list-style-type: none"> - sample current speed and direction at 30-minute intervals over 30 days - vector averaging
Averaging period:	<ul style="list-style-type: none"> - 2 minutes
Mooring:	<ul style="list-style-type: none"> - see figure 6 for description
Start:	<ul style="list-style-type: none"> - 00:00 PDT (UTC-7) September 24, 2011 (as used in Depomod)
End:	<ul style="list-style-type: none"> - 23:30 PDT (UTC-7) October 23, 2011 (as used in Depomod)
Number of data points:	<ul style="list-style-type: none"> - 1,440
Deployed by:	<ul style="list-style-type: none"> - Ocean Dynamics Canada Ltd.

Data Analysis

The data is normally reviewed using Textpad program and data collected before deployment and/or after retrieval is deleted for use. Pre and post-retrieval data is determined from field records and is normally also evident in sharply increased or decreased (depending on surface air temperature) temperature readings and/or in conjunction with similarly changed axis tilt readings, etc. Data is further evaluated for any evident problems. If the data appears satisfactory, Magnetic current direction data is converted to True based on variation from Geomagnetism Magnetic declination calculator (<http://geomag.nrcan.gc.ca/apps/mdcal-eng.php>) using an Excel program created by IEC for the purpose (for the site, Magnetic North = 17.8 degrees True). Analysis took place on the 30 days of data collected at 30 minute intervals (averages over 2 minute period every 30 minutes). An Excel file was used to produce and output the current speed/ direction array. The array is copied to an Excel file that uses the data to provide tabular and graphic summaries of the current speed and direction for the data.

Results are presented in Tables 5 to 8 and Figures 5 and 7 to 24. A toolkit provided by DFO (courtesy of Jon Chamberlain) at a July/04 DEPOMOD workshop to aid in the visual analysis of hydrographic data has been used to prepare Figures 10 to 24 for review.

Table 5. Average current speed and direction for the 30 day period including 1440 records. Note that average direction does not indicate dominant direction(s) in all cases.

	Depth		
	Top	Middle	Bottom
Average direction (Deg T)	345.3	48.5	18.6
Speed cm/s			
Max			
Min	140.4	15.3	21.3
Average	0.1	0.1	0.0
	10.1	5.3	5.3
% of time > 5cm/s	79%	49%	50%

Currents at the site were found to be in general slower at the mid-depth and lower depth. The upper depth had a few events where currents were more rapid (see Figure 19). Current directions recorded at the upper depth indicated some trend northwest and southeast approximately along shore. The mid-depth and lower depths showed very variable directions. Profiler data suggests that currents recorded in the upper 30 meters of the water column were somewhat directional while the currents below were more variable. The current vector plot for the lower depth appears unusual (Figure 24).

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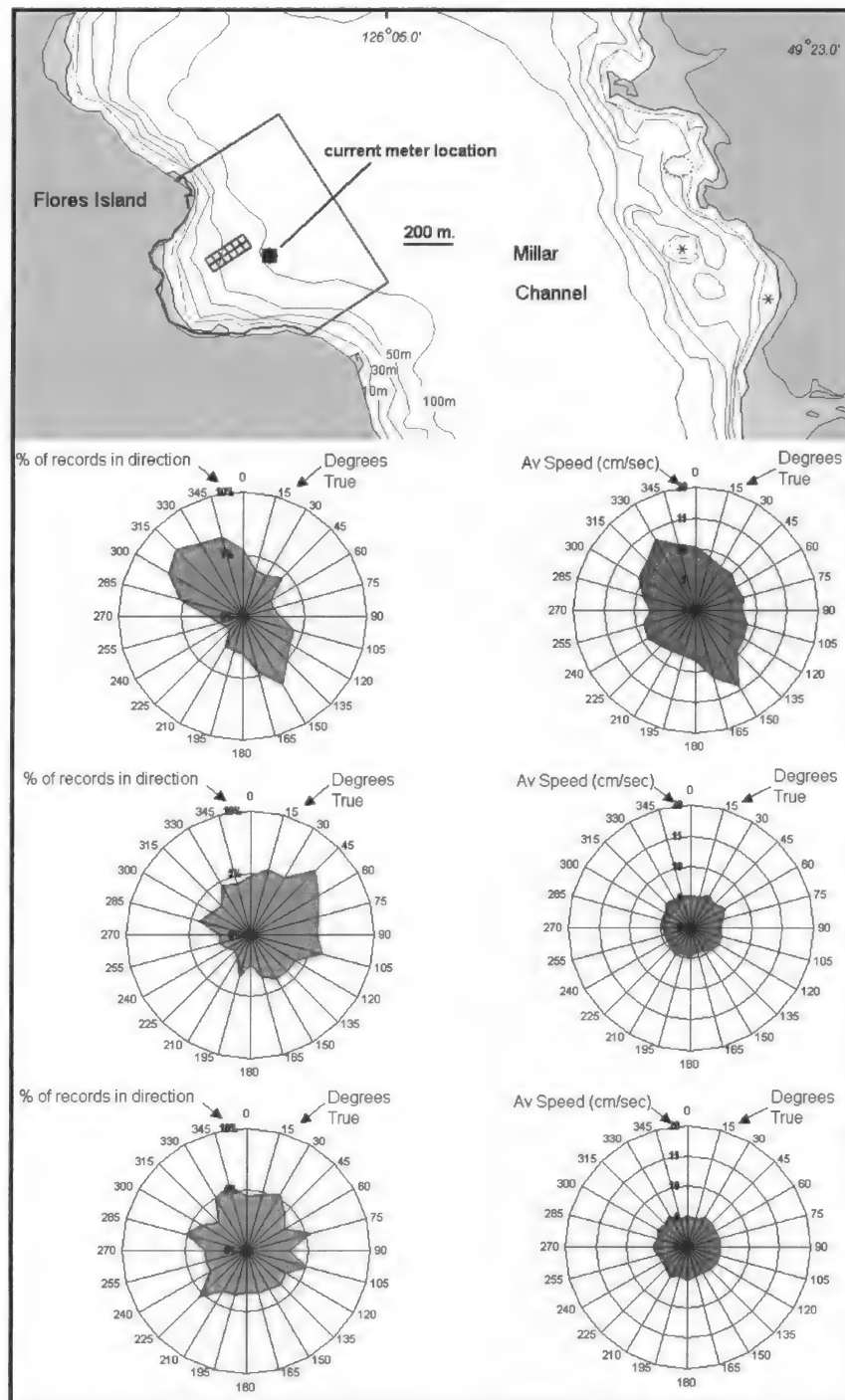


Figure 5. Diagram indicating relation of current measurements at the Millar Channel site for the Sept. 24 to Oct. 23, 2011 period. Average speed recorded and the percent of records in each direction (in which current flows) category are shown for the upper, middle and lower meters. The site diagram has been aligned with true north at the top of the page as shown in the current graphs.

Company Completing Assessment: Ocean Dynamics Canada Ltd
Current Meter Manufacturer and Model: Aquadopp Current Profiler

Serial Number: <u>AQD 5108 & 5115</u>	
Last calibration date:	
Last Service date:	
Deployment Date: <u>09/24/2011</u>	Time: <u>12:00:00 AM</u>
	<u>PST</u>
Recovery Date: <u>11/19/2011</u>	Time: <u>11:30:00 AM</u>
	<u>PST</u>

Mooring Location:	NAD-27	Latitude: <u>49 22.524</u>
	NAD-83	Longitude: <u>126 05.390</u>

Sampling Interval:	Instantaneous: <u>2</u> Minutes
	Averaging: <u>X</u> 120 Samples

Subsurface Floatation:	Description: <u>Three 16kg hard floats</u>
	Floatation: <u>48 kg</u>

Anchor:	Description: <u>Five 18kg Cannon Balls</u>
	Weight: <u>90 kg</u>

Mooring Materials Description	Location of swivels: <u>indicated on diagram</u>
	Type of line: <u>1/2" dual braided nylon</u>
	Method of recovery: <u>Lift from surface float</u>
	other:

Note:
if meter(s) were deployed in a way other than that of a standard sub-surface mooring, please provide an appropriate description of materials and configuration of the meter(s).

Current Profiler Schematic for Miller Site, Sept. 2011

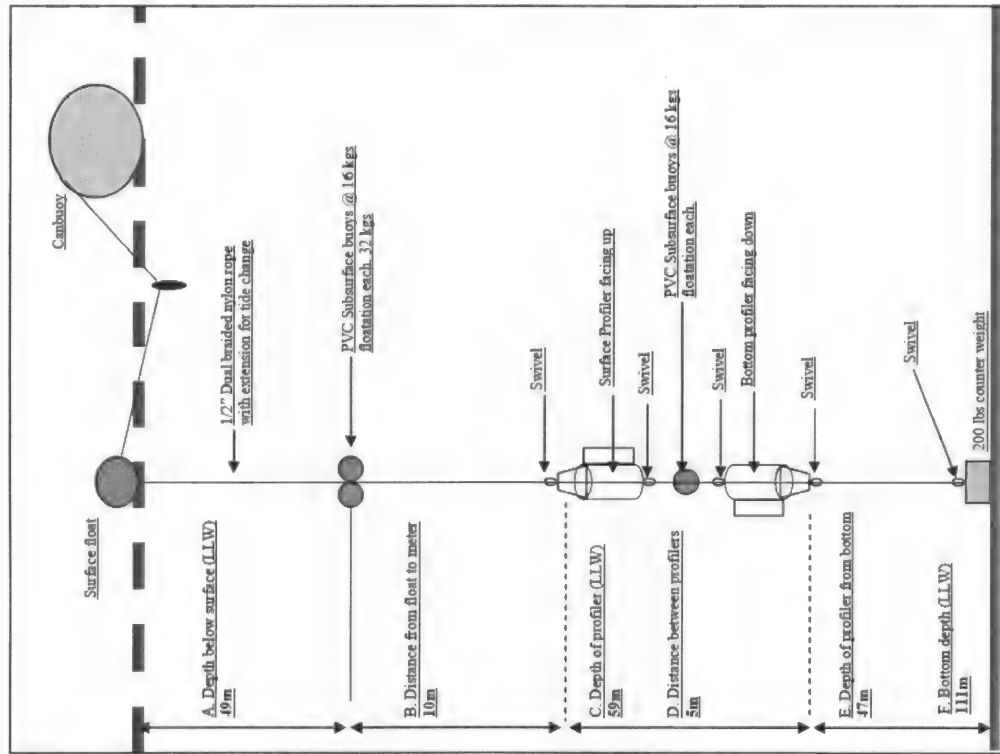


Figure 6. Diagram indicating anchoring and setup of current meters at site. Diagram courtesy of Ocean Dynamics. Data collected at 5, 56 and 96m above bottom.

Table 6. Breakdown of sampled current data for the upper depth suspended at 15 meter depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011. Samples were taken every 30 minutes; each sample represents the average over a 2 minute period. The number of samples with speed and direction within ranges centered at the indicated numbers are shown.

Mooring Site: Millar Channel		Time(24h)	Date(DMY)	Sample#	(PST)
Position:	Top	Start:	0:00	24-Sep-11	1
Deployment Location:		Final:	23:30	23-Oct-11	1440
DGPS:	Latitude: 49 deg 22.524'	Total # of Samples:		1440	
	Longitude: 126 deg 05.390'				
	Datum: NAD83				
Description: Millar Channel Site, Millar Channel, off east side Flores Island					
Station Depth:	15 Meters				
Bottom/ anchor depth:	111 Meters				
Instrument:	make: Nortek Aquadopp				
	model: Aquapro				
	serial #: 5108/5115	Meter Calibration: n/a			
	Records in : Degrees True	(Mag. North = 17.8 deg. True)			
Sample Interval: 30 Minutes					
Total # Measurements:	1440	(Sample is 2 minute average)			
Contact re. deployment:	Ocean Dynamics	Contact re. Reporting:		IEC	

Direction Deg True	Speed (cm/sec)													sum %
	0	3	5	7	10	15	20	30	50	100	150	200		
0	0	8	11	11	23	18	6	1	0	0	0	0	5.4%	
15	0	8	12	10	12	11	3	0	0	0	0	0	3.9%	
30	1	13	7	11	13	6	4	0	0	0	0	0	3.8%	
45	3	8	7	16	18	10	1	0	0	0	0	0	4.4%	
60	3	5	6	9	8	5	1	0	0	0	0	0	2.6%	
75	1	4	4	11	11	5	0	0	0	0	0	0	2.5%	
90	1	5	9	11	16	1	1	0	0	0	0	0	3.1%	
105	2	11	8	15	9	12	5	0	0	0	0	0	4.3%	
120	2	7	11	13	15	12	2	1	0	0	0	0	4.4%	
135	0	13	9	8	21	14	7	0	0	0	0	0	5.0%	
150	0	12	10	19	20	15	7	3	3	1	1	0	6.3%	
165	1	10	8	11	11	17	3	4	1	0	0	0	4.6%	
180	0	6	9	14	8	2	4	0	0	0	0	0	3.0%	
195	4	8	7	4	11	5	2	0	0	0	0	0	2.8%	
210	3	8	9	5	10	4	1	1	0	0	0	0	2.8%	
225	0	2	7	5	6	2	1	0	0	0	0	0	1.6%	
240	0	5	3	4	7	2	1	1	0	0	0	0	1.6%	
255	0	6	3	6	7	6	1	0	0	0	0	0	2.0%	
270	0	6	10	9	12	3	0	0	0	0	0	0	2.8%	
285	4	9	10	15	19	12	6	0	0	0	0	0	5.2%	
300	1	5	16	17	26	18	15	1	0	0	0	0	6.9%	
315	3	8	16	20	23	22	13	4	1	0	0	0	7.6%	
330	0	7	10	12	24	24	15	3	3	0	0	0	6.8%	
345	1	11	10	13	24	21	13	2	0	0	0	0	6.6%	
sum %:	2.1%	12.8%	14.7%	18.7%	24.6%	17.2%	7.8%	1.5%	0.6%	0.1%	0.1%	0.0%		

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Table 7. Breakdown of sampled current data for the middle depth suspended at 55 meter depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011. Samples were taken every 30 minutes; each sample represents the average over a 2 minute period. The number of samples with speed and direction within ranges centered at the indicated numbers are shown.

Mooring Site: Millar Channel		Time(24h)	Date(DMY)	Sample#	(PST)
Position:	Mid-depth	Start:	0:00	24-Sep-11	1
Deployment Location:		Final:	23:30	23-Oct-11	1440
DGPS:	Latitude: 49 deg 22.524'	Total # of Samples: 1440			
	Longitude: 126 deg 05.390'				
	Datum: NAD83				
Description: Millar Channel Site, Millar Channel, off east side Flores Island					
Station Depth:	55 Meters				
Bottom/ anchor depth:	111 Meters				
Instrument:	make: Nortek Aquadopp				
	model: Aquapro				
	serial #: 5108/5115	Meter Calibration: n/a			
	Records in : Degrees True	(Mag. North = 17.8 deg. True)			
	Sample Interval: 30 Minutes				
	Total # Measurements: 1440	(Sample is 2 minute average)			
Contact re. deployment:	Ocean Dynamics	Contact re. Reporting:		IEC	

Direction Deg True	Speed (cm/sec)												sum %
	0	3	5	7	10	15	20	30	50	100	150	200	
0	5	17	21	17	9	0	0	0	0	0	0	0	4.8%
15	7	19	24	18	10	1	0	0	0	0	0	0	5.5%
30	2	19	22	16	17	2	0	0	0	0	0	0	5.4%
45	6	25	27	35	12	2	0	0	0	0	0	0	7.4%
60	0	23	30	13	19	6	0	0	0	0	0	0	6.3%
75	5	25	26	14	7	4	0	0	0	0	0	0	5.6%
90	5	32	18	14	9	0	0	0	0	0	0	0	5.4%
105	6	23	28	19	9	1	0	0	0	0	0	0	6.0%
120	1	21	22	9	7	1	0	0	0	0	0	0	4.2%
135	4	20	13	19	5	0	0	0	0	0	0	0	4.2%
150	8	21	18	8	4	0	0	0	0	0	0	0	4.1%
165	6	19	18	7	1	0	0	0	0	0	0	0	3.5%
180	2	14	9	7	3	0	0	0	0	0	0	0	2.4%
195	4	19	15	12	1	0	0	0	0	0	0	0	3.5%
210	1	10	10	8	2	0	0	0	0	0	0	0	2.2%
225	4	9	5	5	3	0	0	0	0	0	0	0	1.8%
240	6	9	8	5	3	0	0	0	0	0	0	0	2.2%
255	4	12	12	9	1	0	0	0	0	0	0	0	2.6%
270	1	19	7	5	4	0	0	0	0	0	0	0	2.5%
285	9	17	17	10	9	0	0	0	0	0	0	0	4.3%
300	5	19	13	9	5	1	0	0	0	0	0	0	3.6%
315	5	9	11	14	6	2	0	0	0	0	0	0	3.3%
330	6	18	18	19	6	1	0	0	0	0	0	0	4.7%
345	5	16	15	17	9	0	0	0	0	0	0	0	4.3%
sum %:	7.4%	30.2%	28.3%	21.5%	11.2%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

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Table 8. Breakdown of sampled current data for the lower depth suspended at 106 meter depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011. Samples were taken every 30 minutes; each sample represents the average over a 2 minute period. The number of samples with speed and direction within ranges centered at the indicated numbers are shown.

Mooring Site: Millar Channel		Time(24h)	Date(DMY)	Sample#	(PST)
Position:	Bottom	Start:	0:00	24-Sep-11	1
Deployment Location:		Final:	23:30	23-Oct-11	1440
DGPS:	Latitude: 49 deg 22.524'	Total # of Samples: 1440			
	Longitude: 126 deg 05.390'				
	Datum: NAD83				
Description: Millar Channel Site, Millar Channel, off east side Flores Island					
Station Depth:	106 Meters				
Bottom/ anchor depth:	111 Meters				
Instrument:	make: Nortek Aquadopp				
	model: Aquapro				
	serial #: 5108/5115	Meter Calibration: n/a			
	Records in : Degrees True	(Mag. North = 17.8 deg. True)			
	Sample Interval: 30 Minutes				
Total # Measurements:	1440 (Sample is 2 minute average)				
Contact re. deployment:	Ocean Dynamics	Contact re. Reporting:	IEC		

Direction Deg True	Speed (cm/sec)												sum %
	0	3	5	7	10	15	20	30	50	100	150	200	
0	5	21	14	14	8	2	0	0	0	0	0	0	4.4%
15	10	26	12	12	7	1	0	0	0	0	0	0	4.7%
30	3	20	22	18	10	3	0	0	0	0	0	0	5.3%
45	3	18	14	20	7	0	0	0	0	0	0	0	4.3%
60	3	16	15	10	4	2	0	0	0	0	0	0	3.5%
75	5	20	24	17	10	2	0	0	0	0	0	0	5.4%
90	2	16	13	14	4	1	0	0	0	0	0	0	3.5%
105	7	21	14	21	7	2	1	0	0	0	0	0	5.1%
120	5	10	16	15	4	2	0	0	0	0	0	0	3.6%
135	5	19	13	12	5	1	1	0	0	0	0	0	3.9%
150	7	10	19	10	6	0	0	0	0	0	0	0	3.6%
165	3	14	18	13	3	0	0	0	0	0	0	0	3.5%
180	1	21	10	9	7	2	0	0	0	0	0	0	3.5%
195	6	15	12	14	6	0	0	0	0	0	0	0	3.7%
210	3	15	13	18	4	2	0	0	0	0	0	0	3.8%
225	5	30	17	16	6	2	0	0	0	0	0	0	5.3%
240	5	18	14	8	3	0	0	0	0	0	0	0	3.3%
255	3	19	8	12	7	0	0	0	0	0	0	0	3.4%
270	1	15	13	12	7	1	0	0	0	0	0	0	3.4%
285	2	27	18	18	7	0	0	0	0	0	0	0	5.0%
300	3	16	18	15	6	2	0	0	0	0	0	0	4.2%
315	1	12	17	14	2	0	0	0	0	0	0	0	3.2%
330	2	19	18	17	13	2	0	0	0	0	0	0	4.9%
345	5	33	22	11	6	2	0	0	0	0	0	0	5.5%
sum %:	6.6%	31.3%	26.0%	23.6%	10.3%	2.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	

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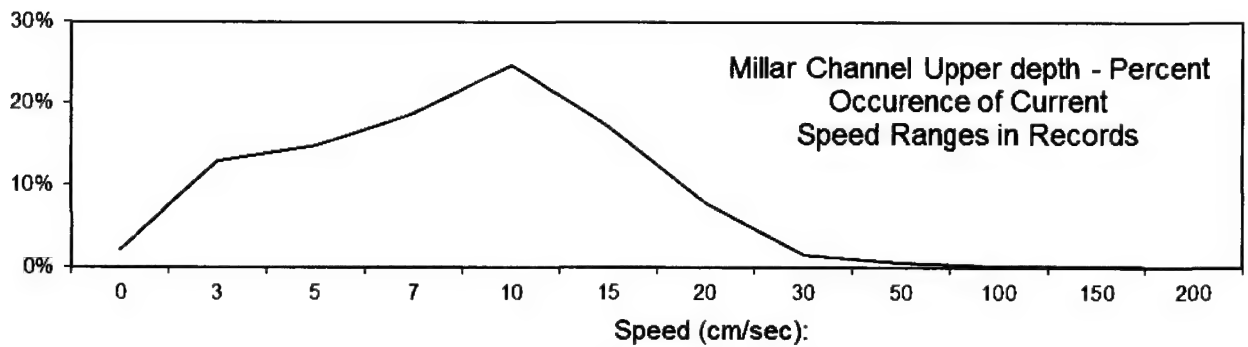


Figure 7. Percent occurrence of current speed for the upper depth 15 meters depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011.

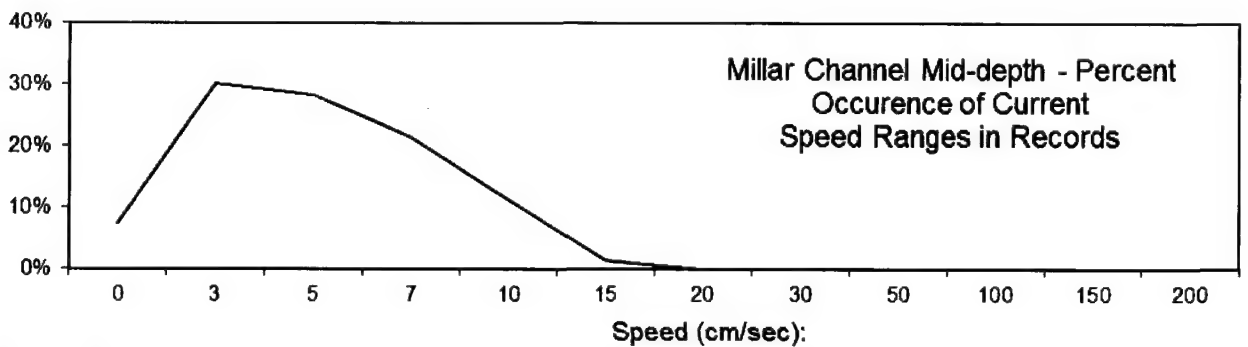


Figure 8. Percent occurrence of current speed for the midwater depth at 55 meters depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011.

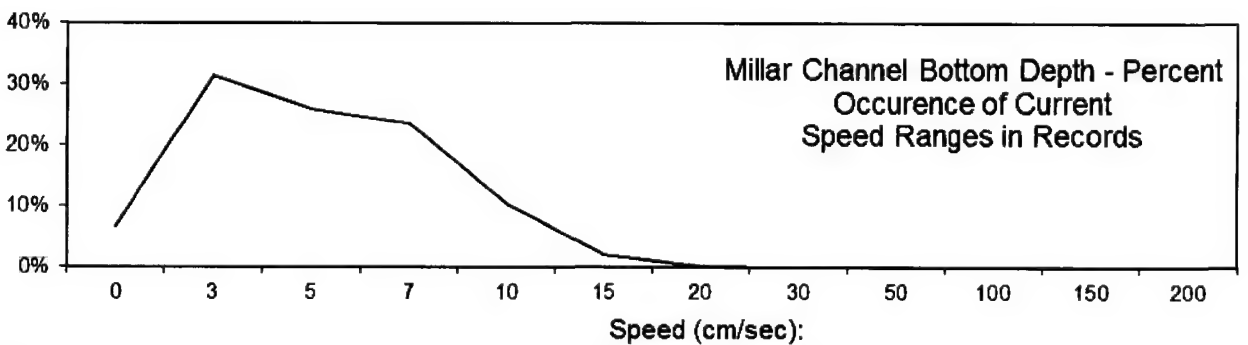


Figure 9. Percent occurrence of current speed for the lower depth at 106 meters depth at the Millar Channel site for Sept. 24 to Oct. 23, 2011.

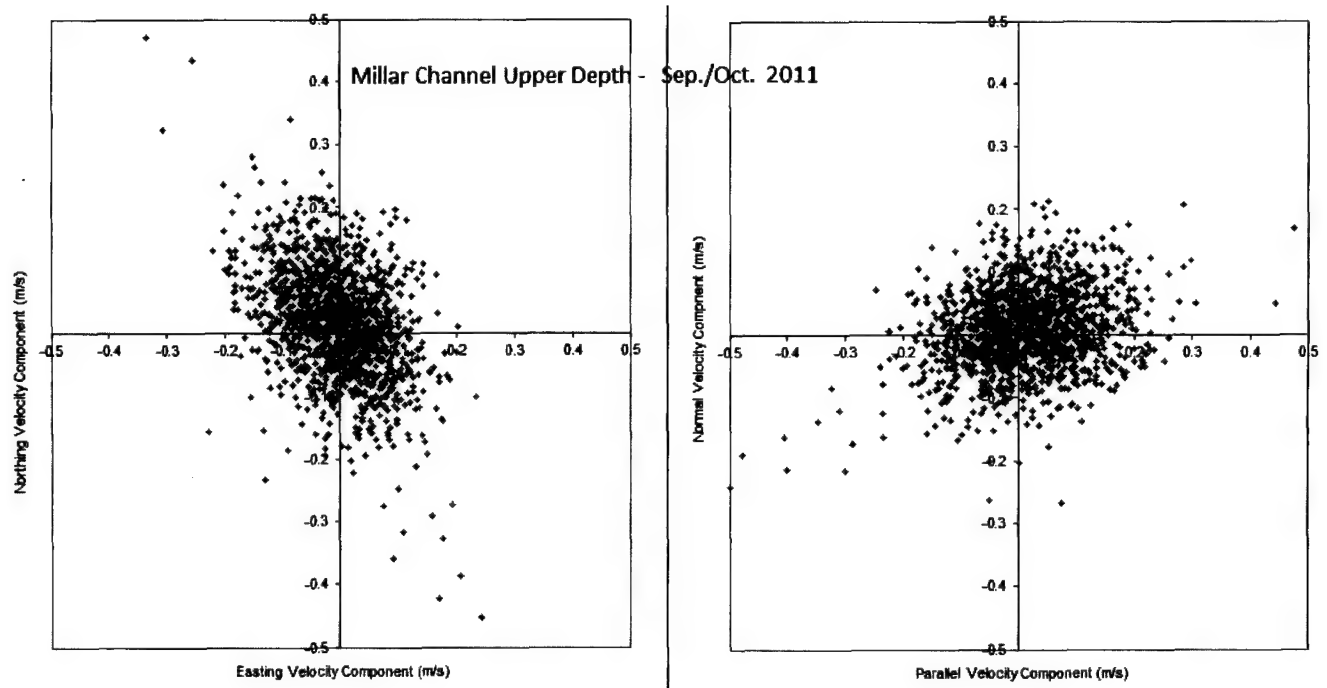


Figure 10. Scatter plots of current speed and directions for the upper depth.

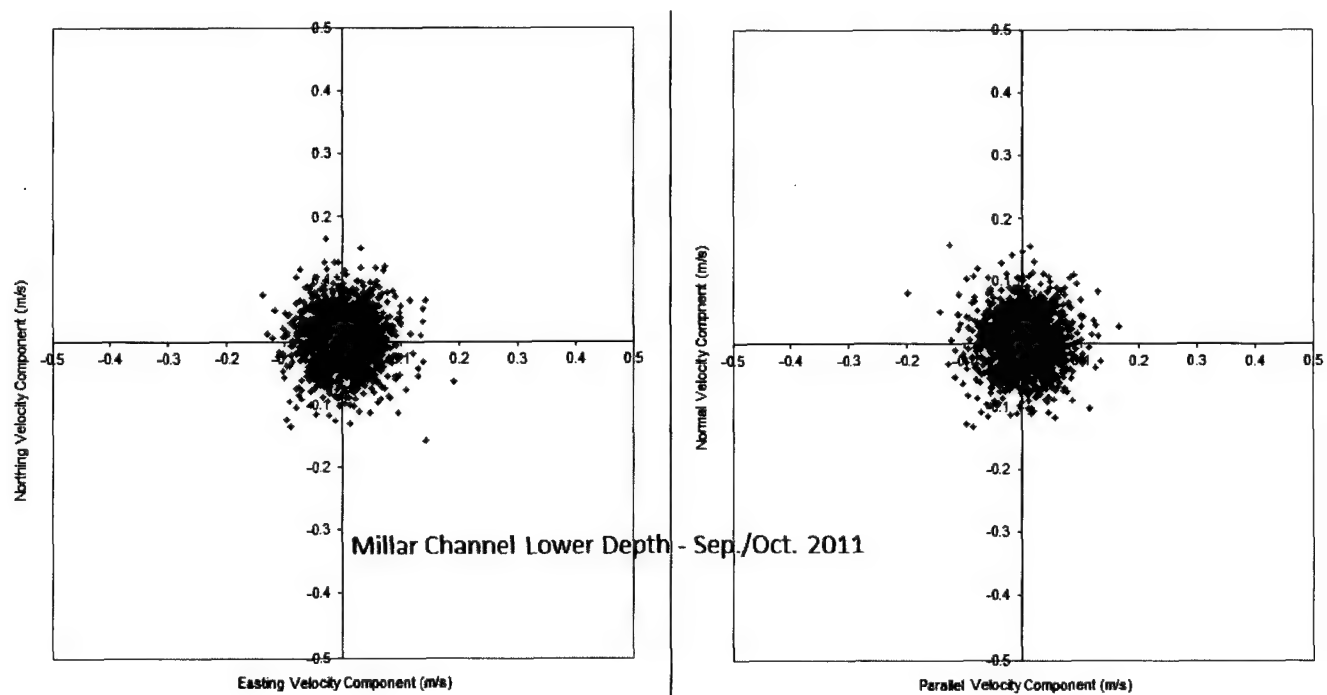


Figure 11. Scatter plots of current speed and directions for the midwater depth.

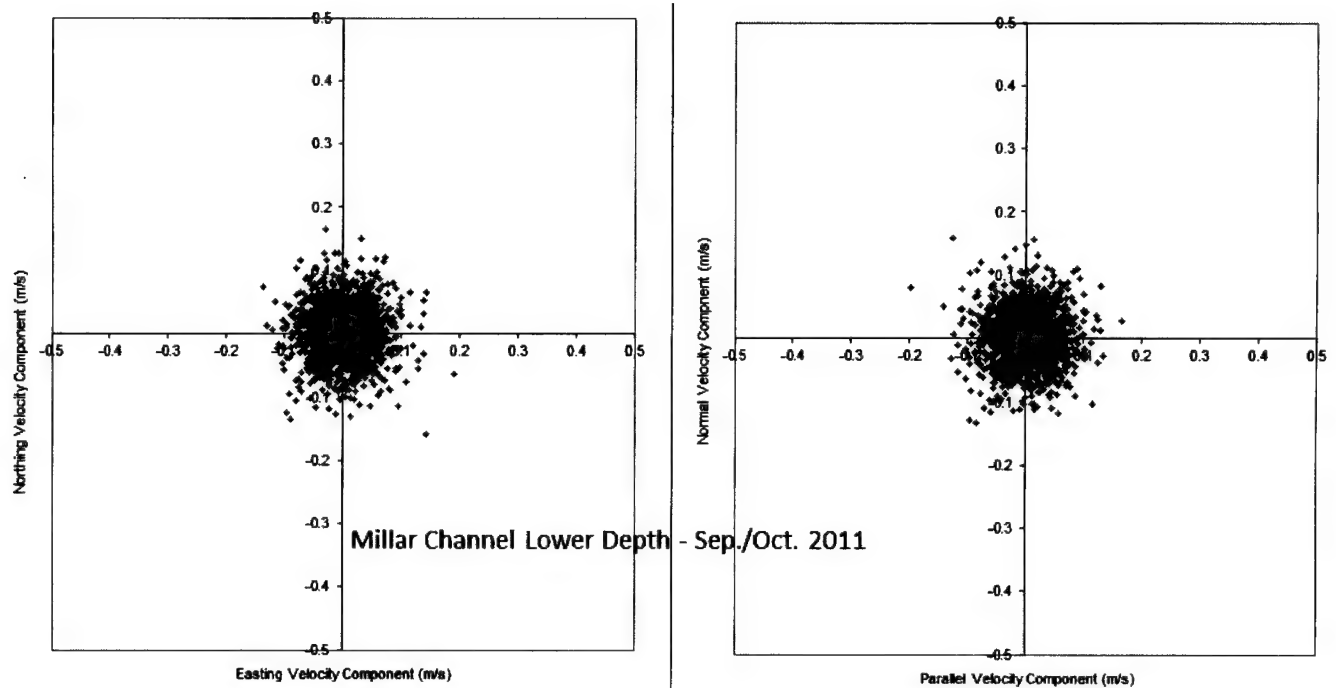


Figure 12. Scatter plots of current speed and directions for the bottom depth.

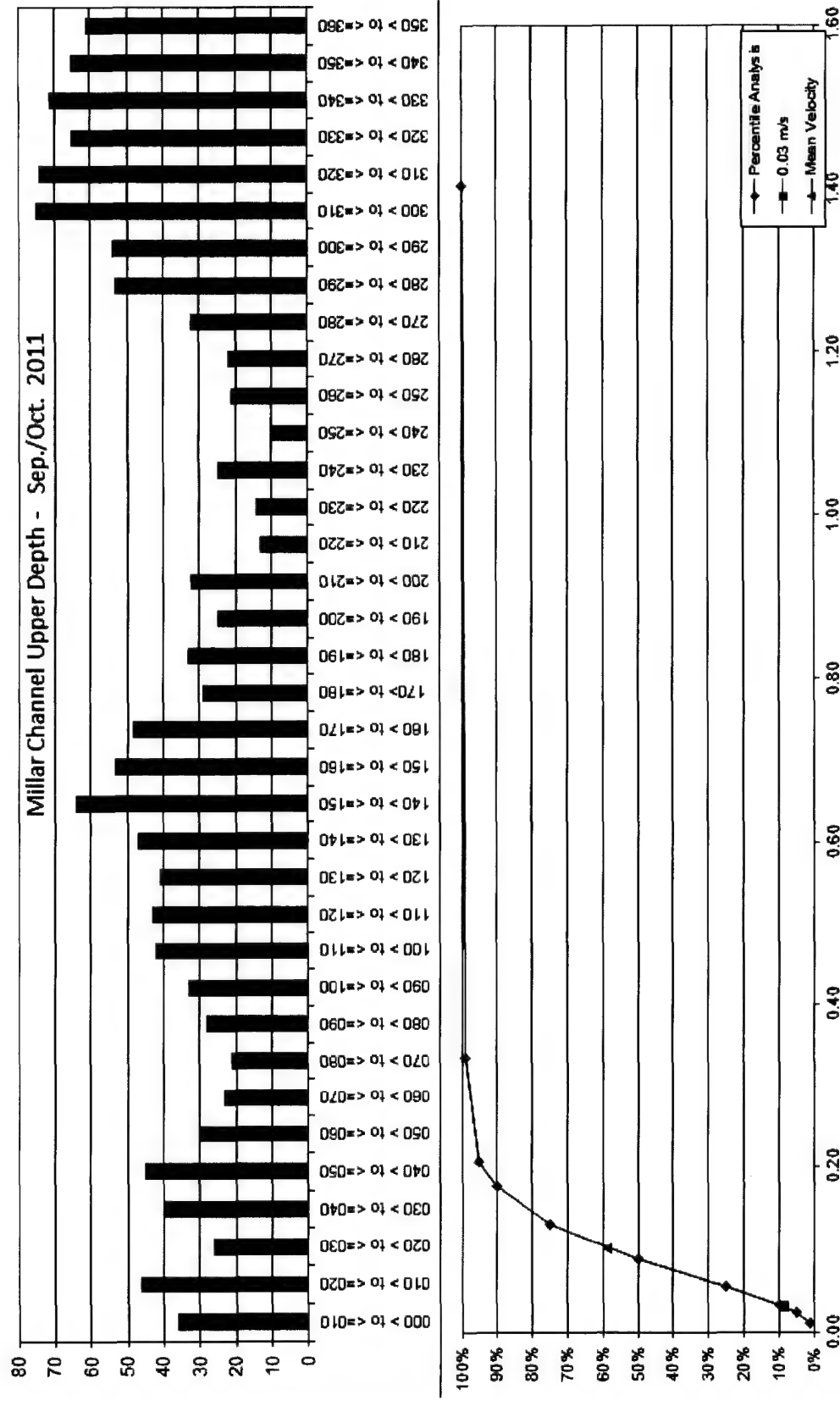


Figure 13. Frequency analysis plots of current direction and speed for the upper depth.

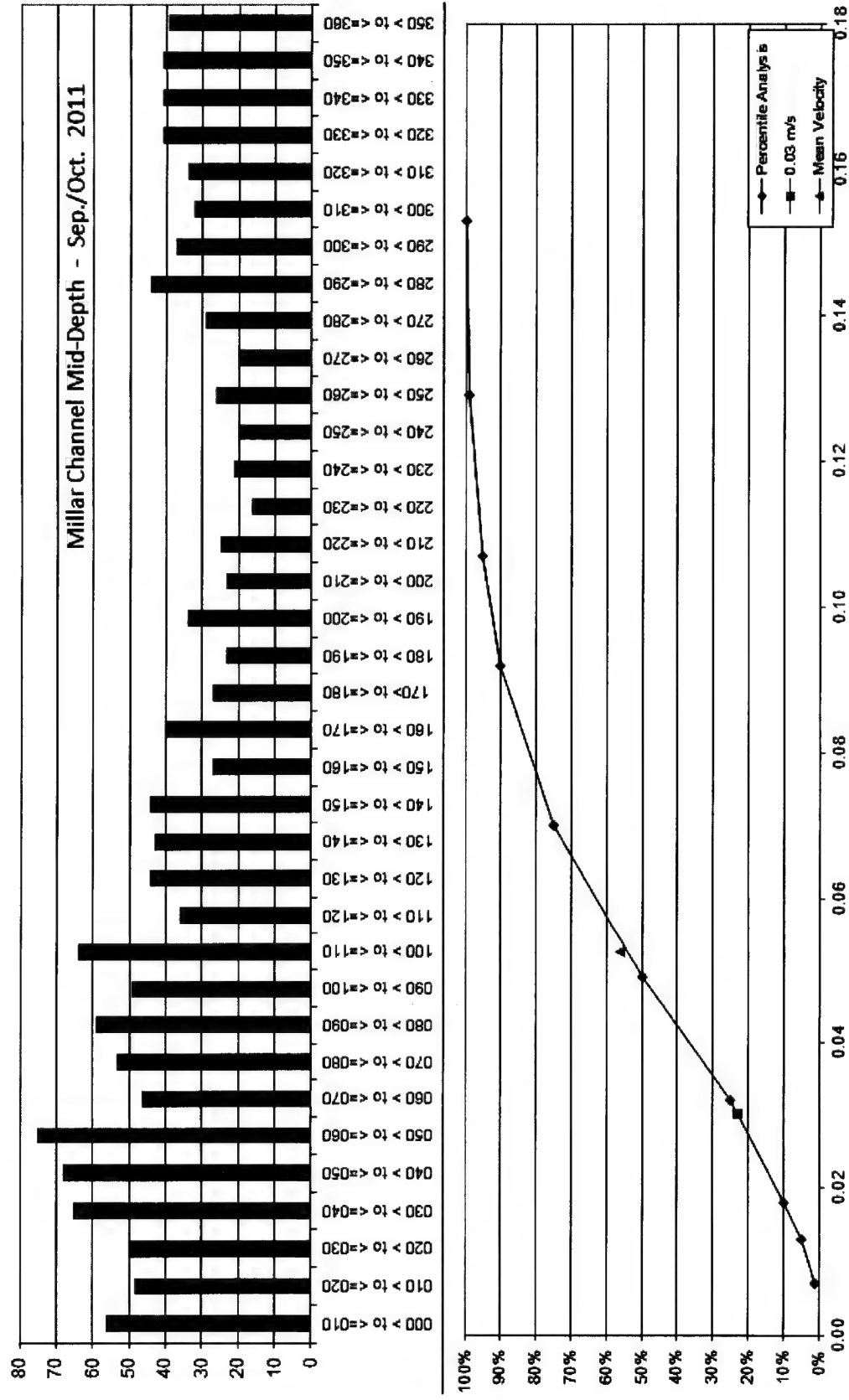


Figure 14. Frequency analysis plots of current direction and speed for the midwater depth.

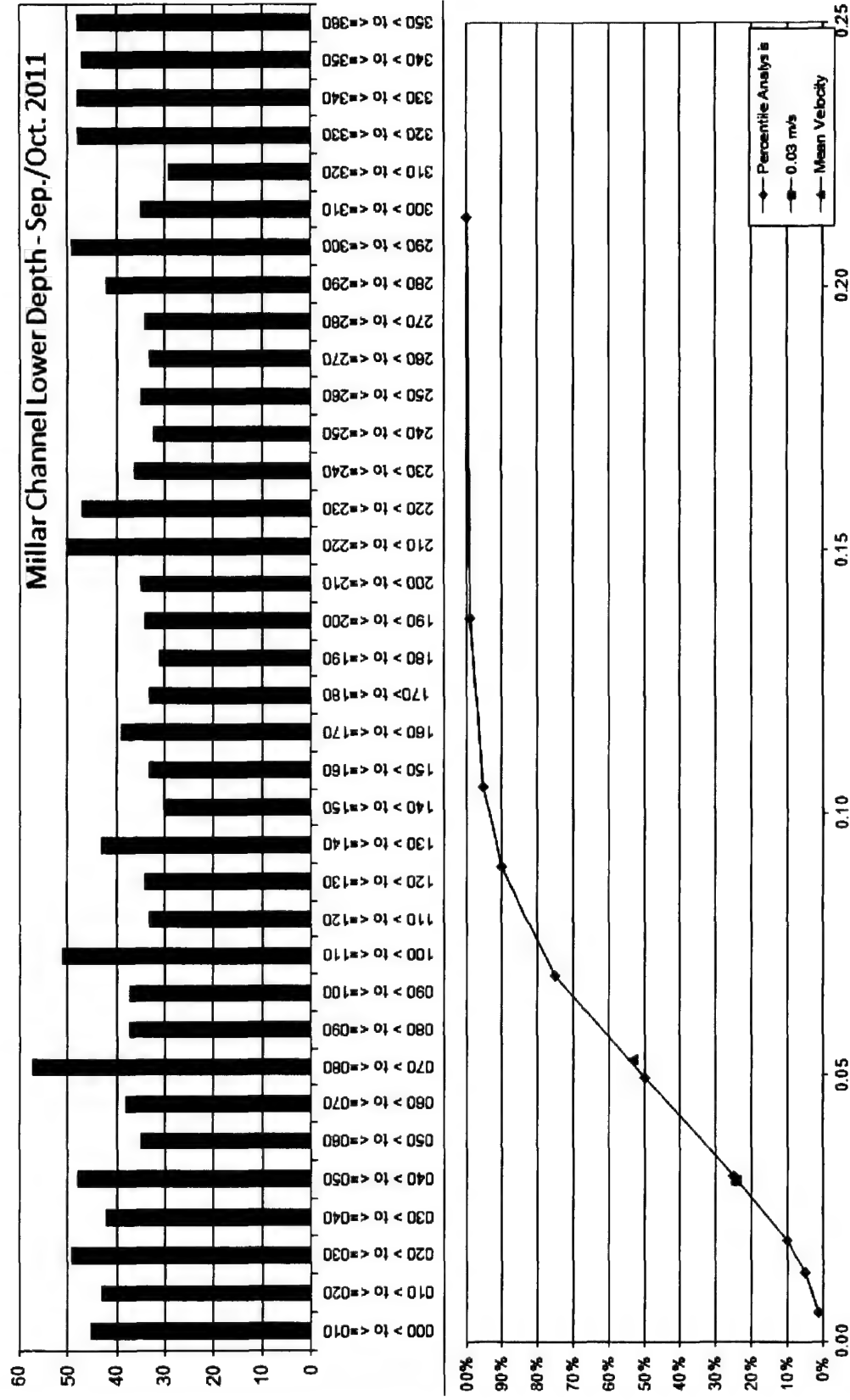


Figure 15. Time series plots of current speed and direction for the bottom depth.

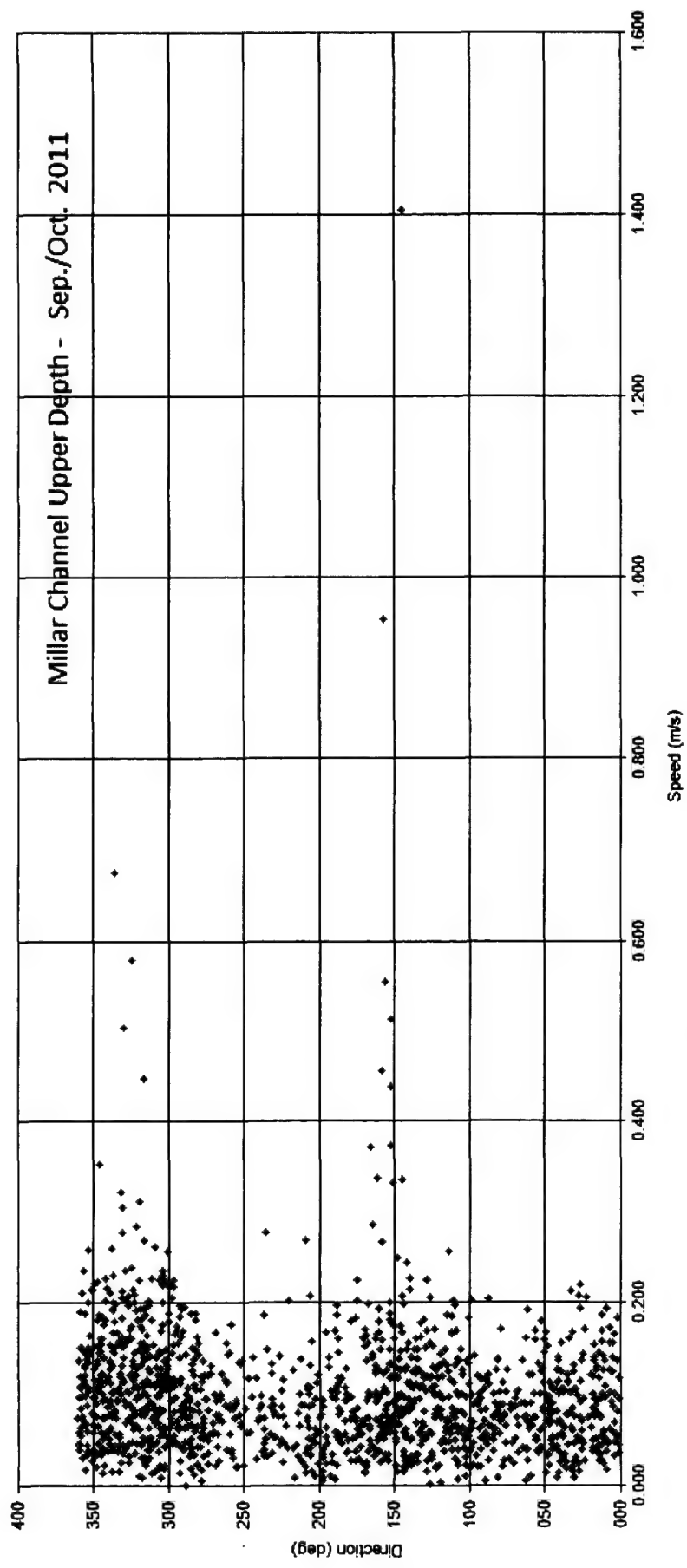


Figure 16. Speed versus direction plot for upper depth.

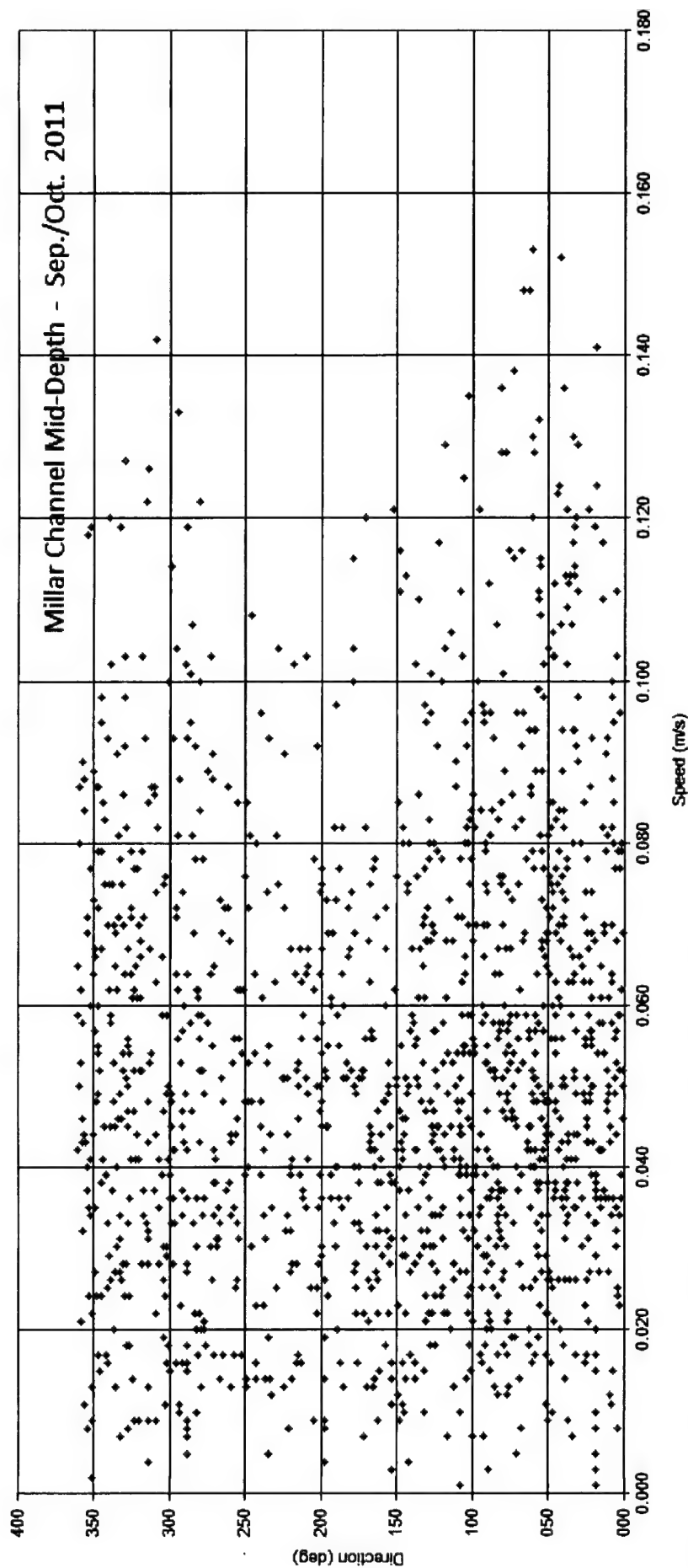


Figure 17. Speed versus direction plot for midwater depth).

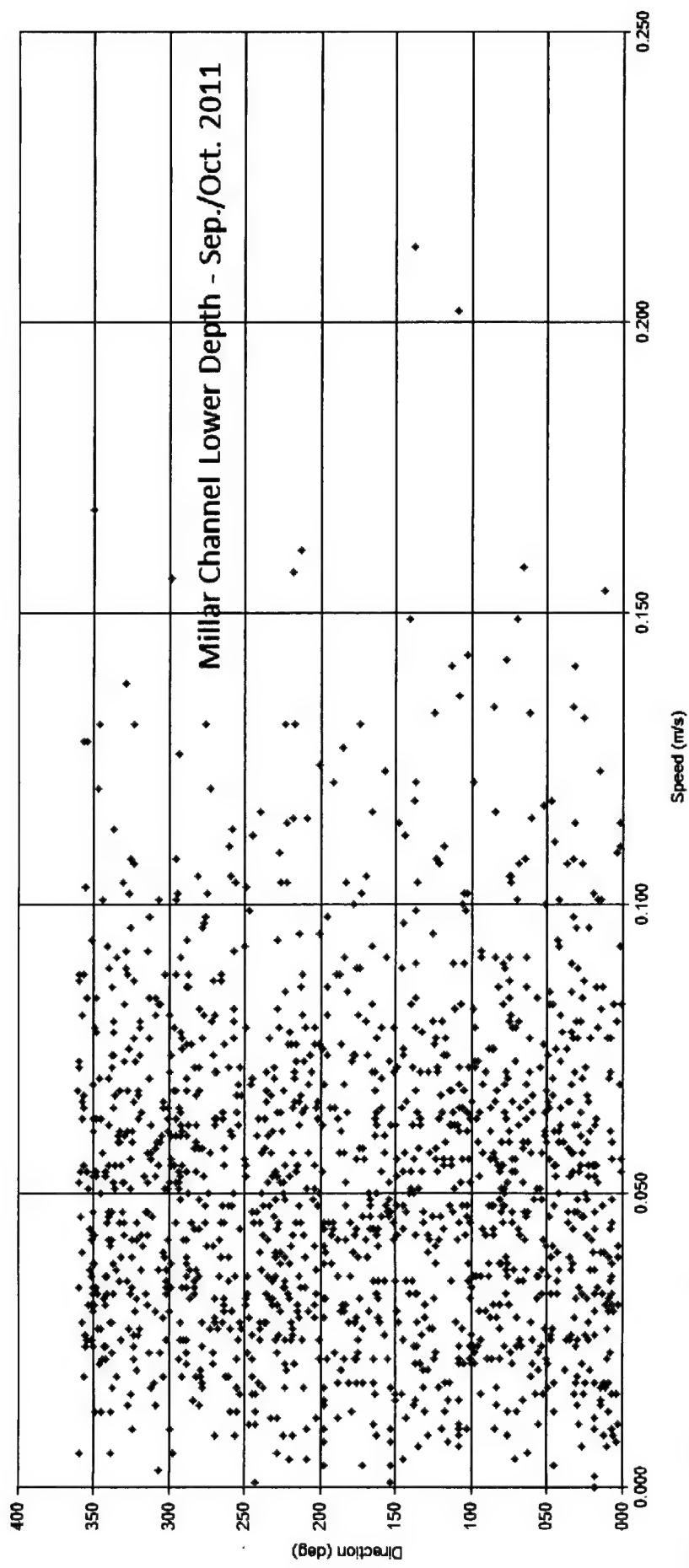


Figure 18. Speed versus direction plot for lower depth.

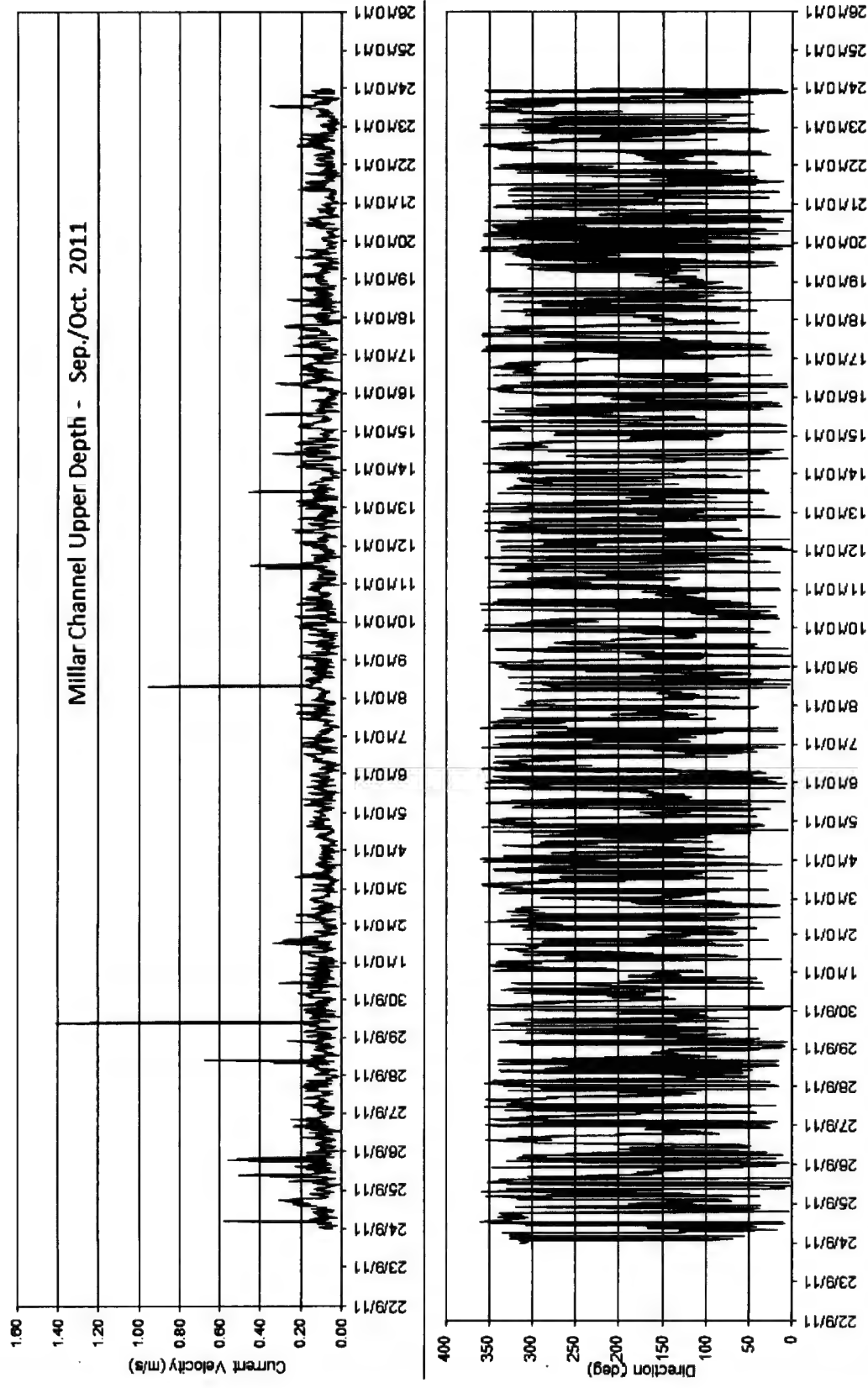


Figure 19. Time series plots of current speed and direction for the upper depth (note that velocity scale is quite different than mid-depth and bottom time series plots).

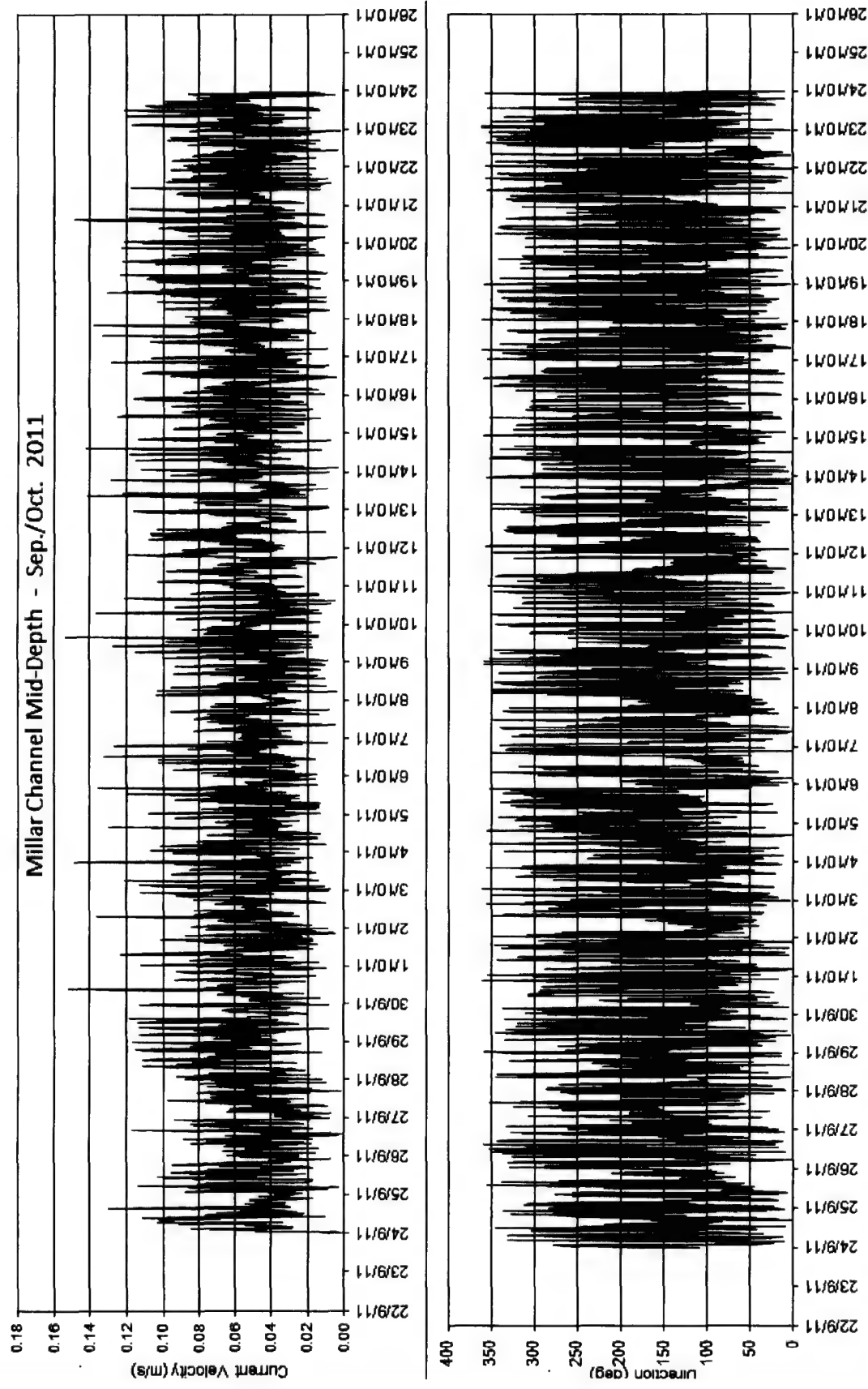


Figure 20. Time series plots of current speed and direction for the mid-water depth.

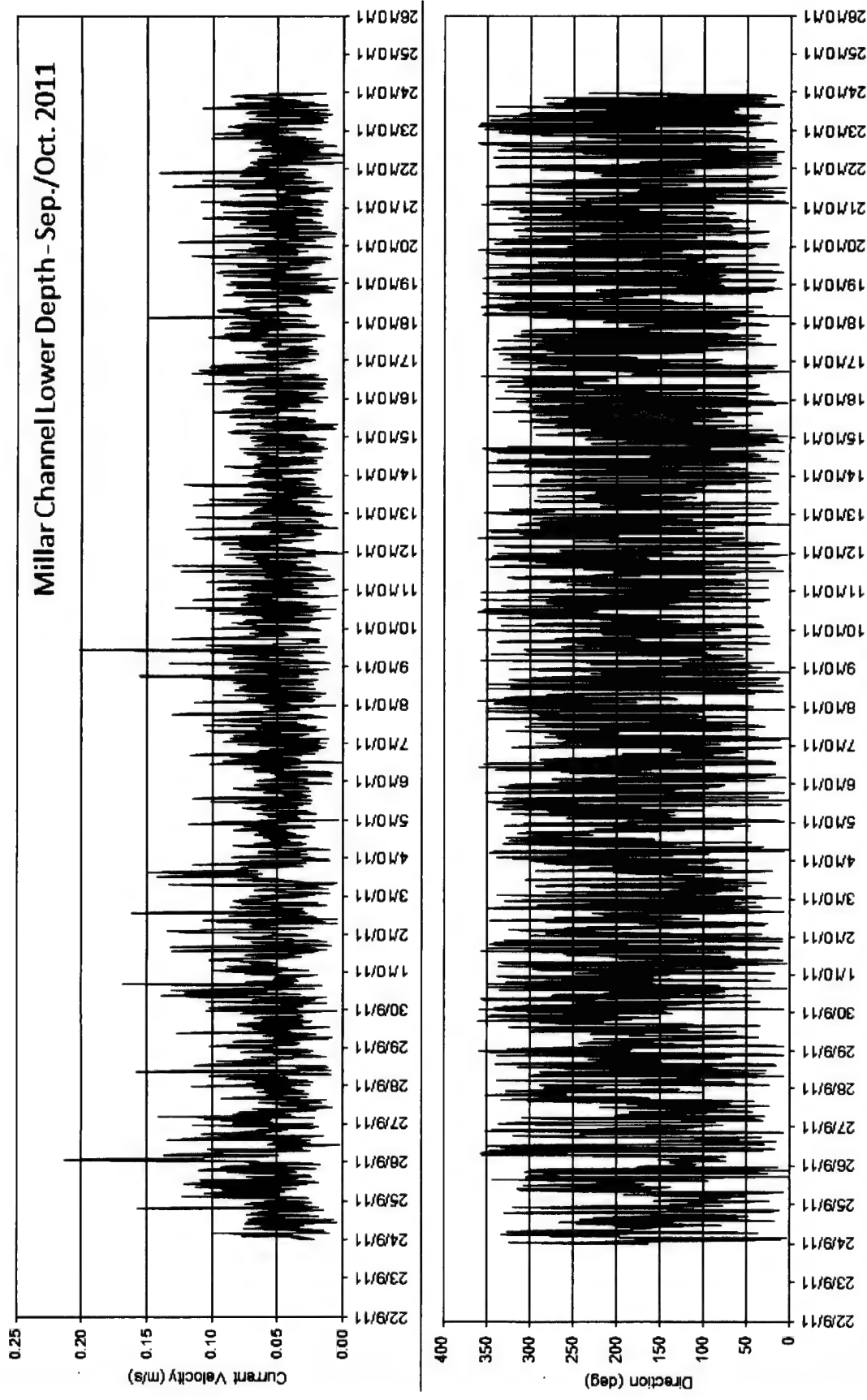


Figure 21. Time series plots of current speed and direction for the bottom depth.

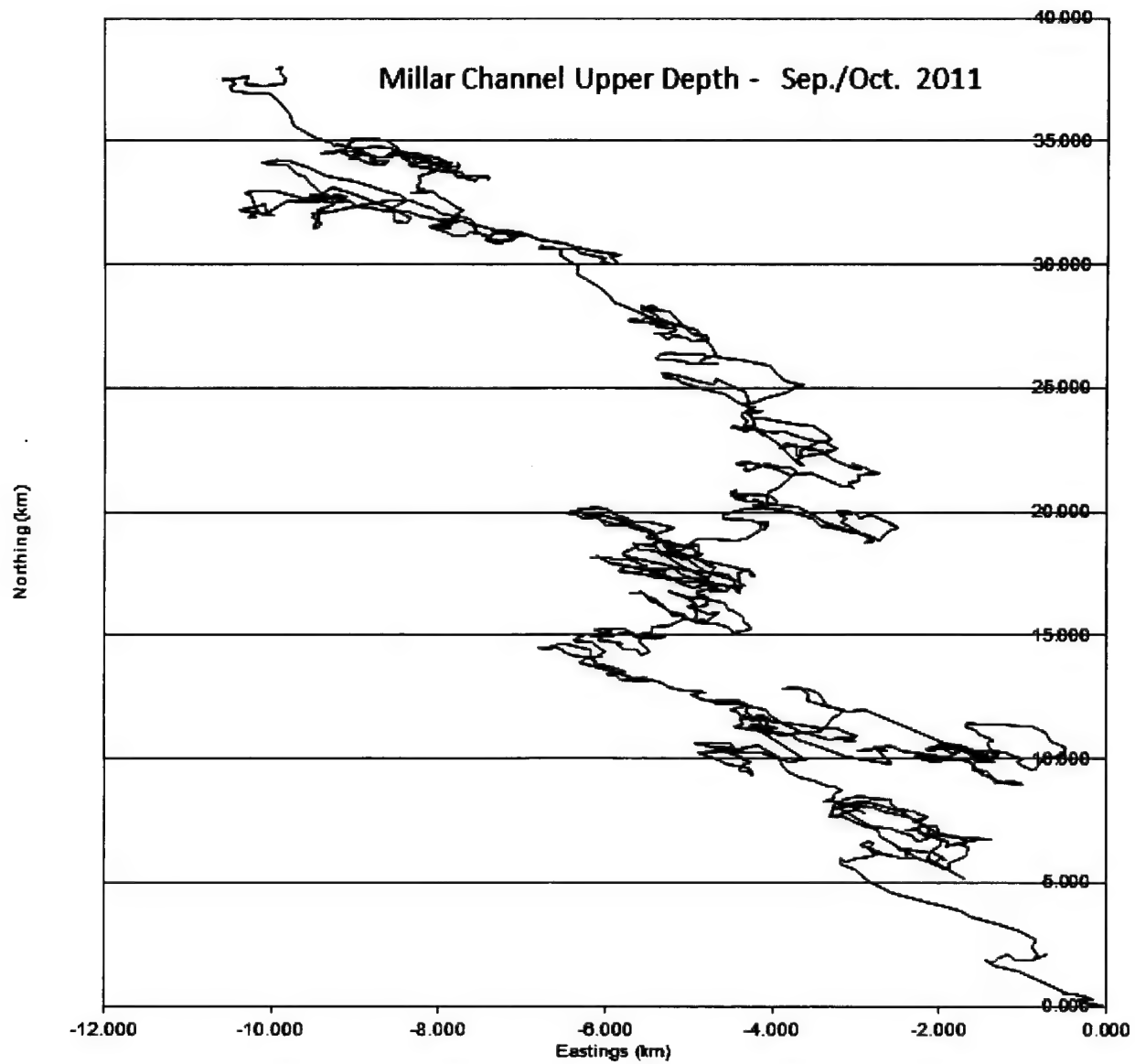


Figure 22. Cumulative vector plot for upper depth.

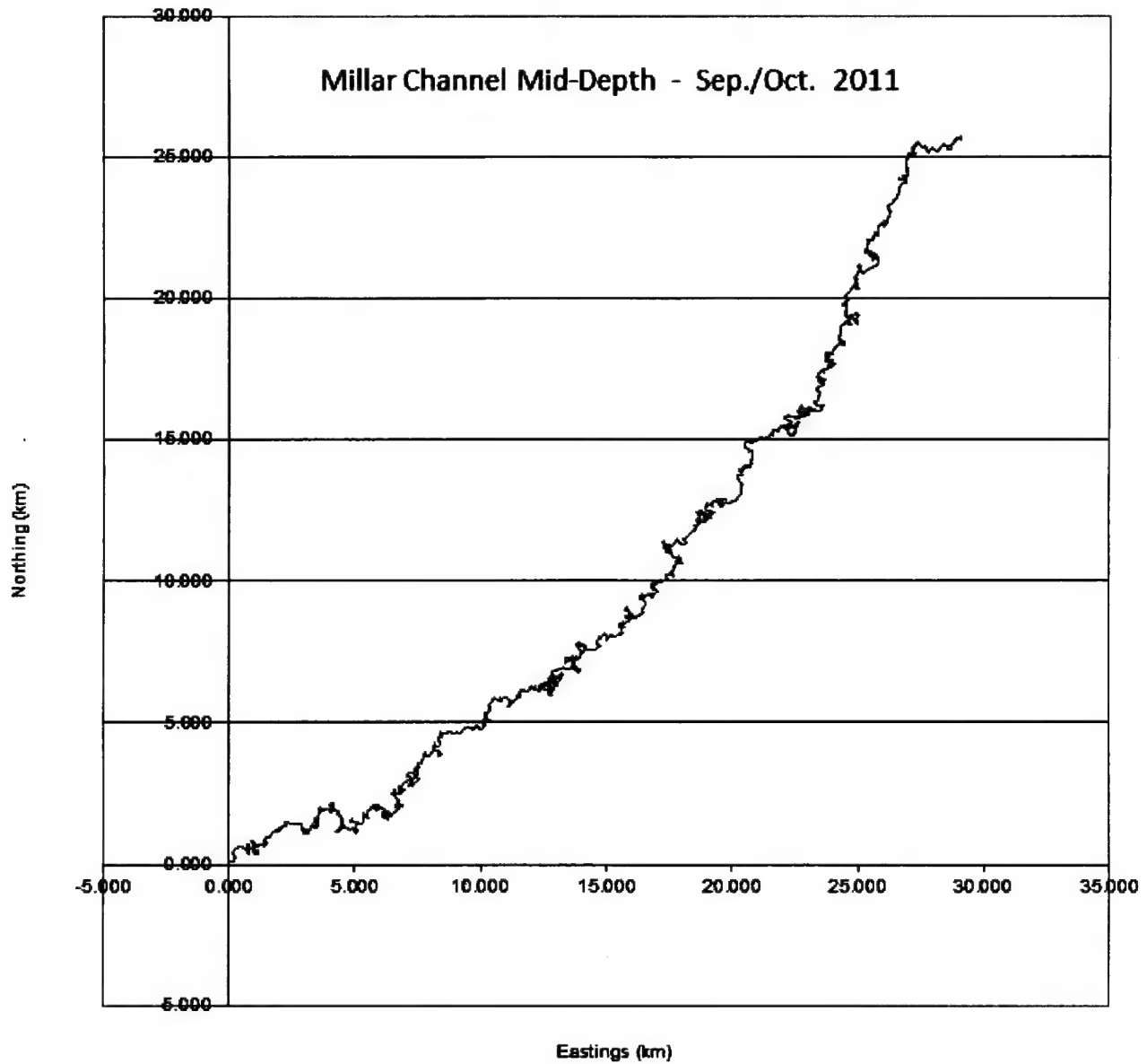


Figure 23. Cumulative vector plot for midwater depth.

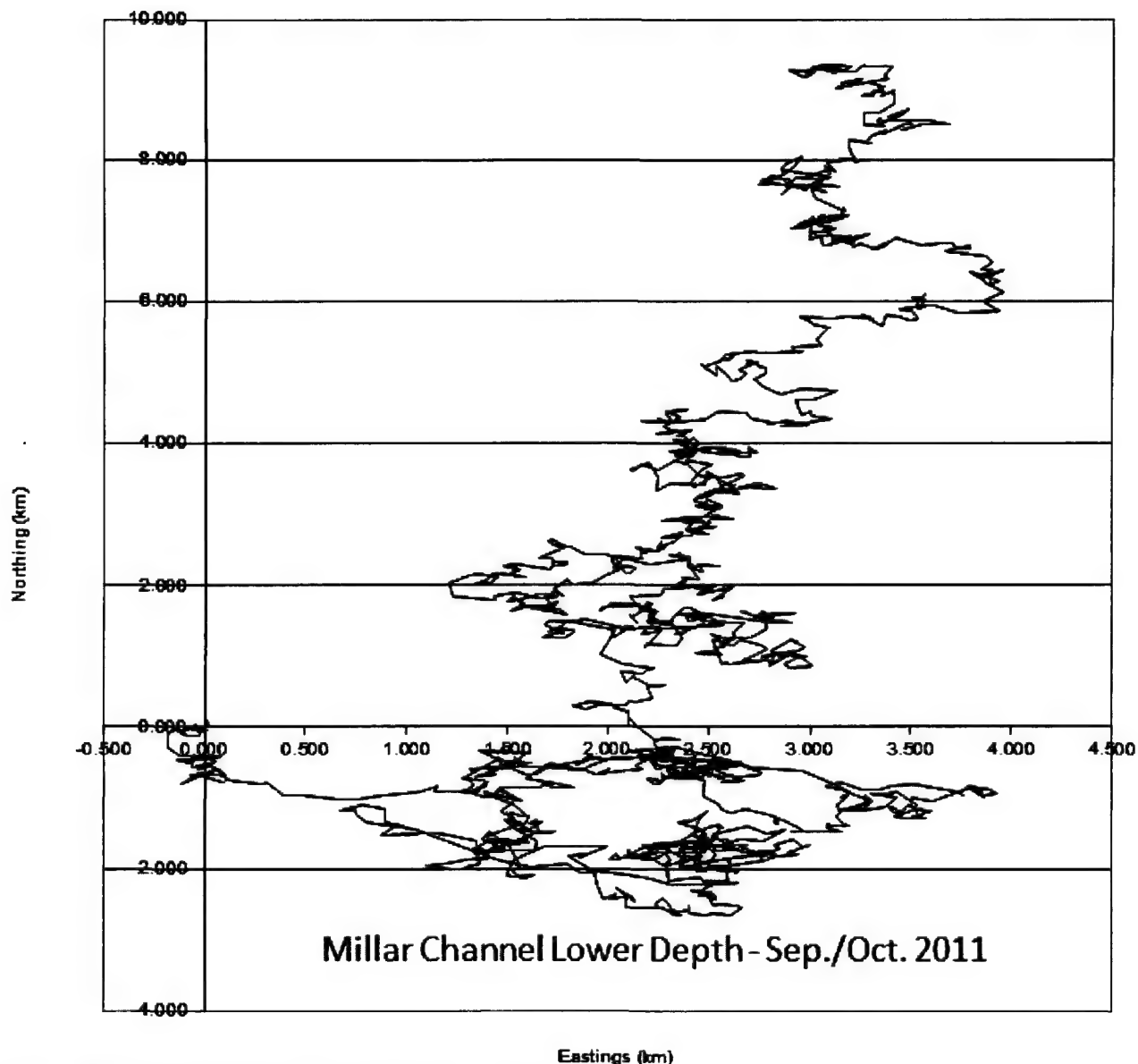


Figure 24. Cumulative vector plot for lower depth.

Contact re. deployment: Ocean Dynamics Canada Ltd. at oceandyn@shaw.ca

Contact regarding model simulations: [REDACTED] of IEC at [REDACTED]

Also contained in appended file: Millar Ch DEPOMOD 2x6 Nov12 2012.zip

- Raw current data
- DEPOMOD files used in Grid generation, Particle tracking, and Resuspension modules
- Associated shp files for pens and site boundaries.

s.19(1)

Page 317
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From: Jones, Simon
To: Shaw, Kerra
Cc: Waddington, Zac; Paylor, Adrienne
Subject: FW: Sea lice management and resistance in Clayoquot Sound
Date: August-07-18 11:05:17 AM

Hi Kerra,

Just saw the out of office from Zac and Adrienne.

Cheers, Simon

From: Jones, Simon
Sent: August-07-18 11:04 AM
To: Waddington, Zac
Cc: Paylor, Adrienne
Subject: FW: Sea lice management and resistance in Clayoquot Sound

Hi Zac,

I haven't seen recent bio-assay data from farms in Clayoquot Sd, and cannot provide [REDACTED] with an informed answer to his question.

In any event, your shop will likely have additional information to address this question.

Let me know if you require my input.

Best, Simon

Simon R.M. Jones
Acting Section Head AAH
Aquatic Animal Health Section
Pacific Biological Station
Fisheries and Oceans Canada
3190 Hammond Bay Road
Nanaimo, British Columbia
V9T 6N7, Canada
Tel: 250 729 8351
Fax: 250 756 7053
E-mail: simon.jones@dfo-mpo.gc.ca

s.19(1)

From: [REDACTED]
Sent: August-06-18 1:34 PM
To: Jones, Simon
Subject: Sea lice management and resistance in Clayoquot Sound

Hi Simon,

My name is [REDACTED] the Cedar Coast Field Station,

situated on Vargas Island here in Clayoquot Sound. This spring we were conducting juvenile salmon and sealice monitoring during the juvenile salmon out migration. The outbreak seen on farms in Clayoquot Sound this year also seemed to coincided with high abundance and prevalence of sea lice on the wild fry and smolts we were assessing in the region. We had a small survey this year but the fish we did find had lice loads much higher than was reported for juvenile salmon in the region during previous assessments.

There has been lots of talk about the use of hydrogen peroxide to treat sea lice on the Cermaq farms here, including discussing resistance to slice developing. I have heard lots of rumblings and rumours mentioning resistance developing but I have not heard anything from an official source. It is mentioned in one of Cermaq's permit applications for use of hydrogen peroxide around Campbell river, but they do not mention the location in which slice resistance lice were found. Is there any concrete evidence of slice resistance forming in BC or is the treatment with hydrogen peroxide here in Clayoquot Sound an attempt to reduce the potential for resistance by using an array of treatments?

All the best,



--



Cedar Coast Field Station



s.19(1)

Manchester, Howie

From: [REDACTED]
Sent: August-10-18 5:01 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle; [REDACTED] Waddington, Zac
Subject: *Confidential: RE: ITC applications #S202 and S203 - ON HOLD
Attachments: 2019 Sealice Mitigation Plan Tofino North.pdf

Hello Zac,

Please find attached our Mitigation Plan for Sea Lice during the stocking of our Marine facilities in our Tofino North Operations.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

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From "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
To [REDACTED] "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
Cc [REDACTED] "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>, "Charbonneau, Michelle" <Michelle.Charbonneau@dfo-mpo.gc.ca>, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Date 02/08/2018 03:14 PM
Subject RE: ITC applications #S202 and S203 - ON HOLD

Hello [REDACTED]
As discussed, we'll be putting these applications on hold pending further information on updated sea lice management strategies for your Clayoquot sites. In the meantime, we will complete the review of fish health records and this week's site visit so that we are in a position to move forward with our assessment once those details have been provided.

Thank you,

Melanie

Melanie McNabb
Governance Coordinator / Coordinatrice de la gouvernance
Fisheries and Oceans Canada, Pacific Region / Pêche et Océans Canada, région du pacifique
200 - 401 rue Burrard St, Vancouver, BC V6C 3S4
Tel. / tél (604) 666-6894
Fax / téléc (604) 666-1076
e-mail / courriel melanie.mcnabb@dfo-mpo.gc.ca

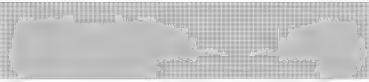
From: [REDACTED]
Sent: July-20-18 4:59 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle
Subject: *Confidential: Application for transfer of Smolts from Ocean Farms (#180) to Marine Facilities - Dixon (#234), Millar (#1507) & Ross (#526)

Hello,

Please find attached an applications for a licences to transfer fish from our Ocean Farms Hatchery to our marine facilities Dixon, Millar & Ross Pass (Clayoquot Region).

Should you have any questions please let me know.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

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CERMAQ

Zac Waddington
Fisheries and Oceans Canada
Aquaculture Management Division, Snr FishVet
#103 – 2435 Mansfield Drive ,Courtenay, BC

Campbell River, 10 August 2018

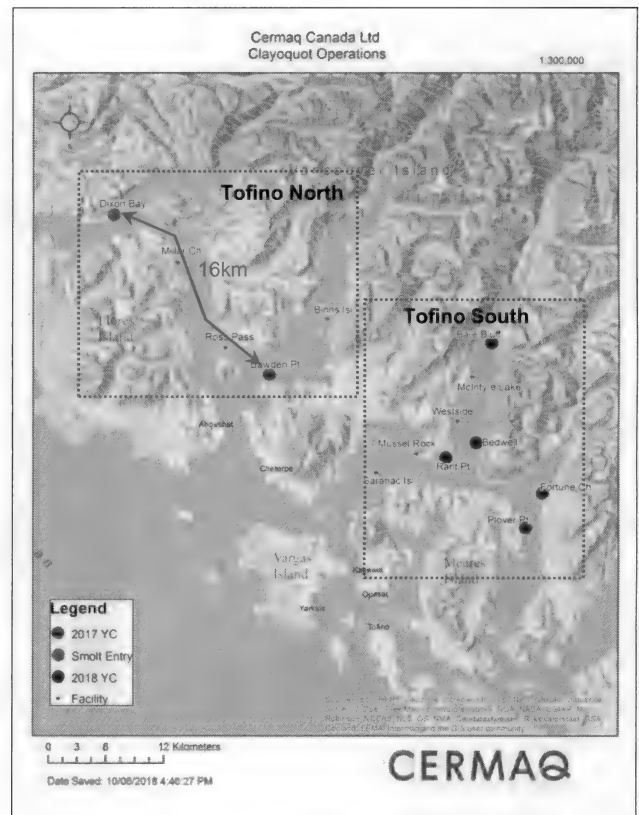
2019 Clayoquot Sound (Tofino North) Sea Lice Management Plan

Dear Zac,

Please find below the measures that Cermaq Canada is putting into place to mitigate against sea lice during the entry of our 2019 Year Class Smolts into the Clayoquot Sound Region.

2018 Fall Smolt Entry Location

- All Fall smolt entries will be entered into Tofino North area only.
- The last of 2017YC will be harvested out of Tofino North before any entry of 2019YC.
- As of August 8th we started harvesting the last 2017 YC fish in Tofino North (Bawden). Harvesting from Bawden has been accelerated and involves maximizing the processing capacity of both Tofino and Brown's Bay processing plants.
- Last day of harvest for Bawden is August 28th.
- The first smolts going into Tofino North will be entered at Dixon on August 29th.
- Dixon was chosen because it is the farthest site from Bawden with 16km distance between them with predominant current flow through Sidney and Shelter Inlet and not from Millar Channel.



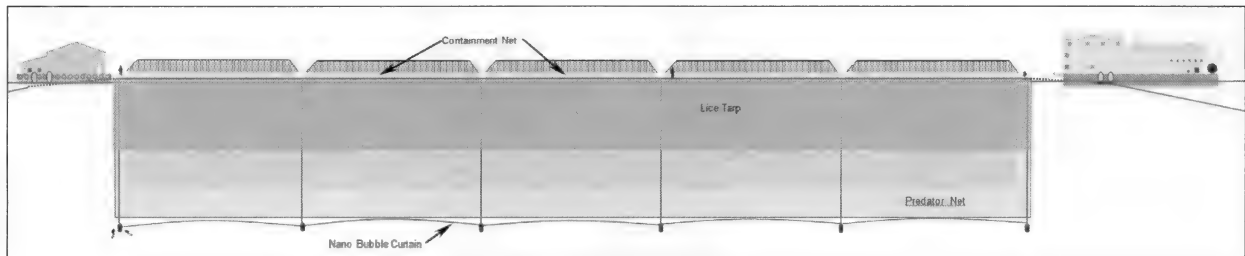
Cermaq Canada Ltd.

203-919 Island Highway, Campbell River, BC
V9W 2C2 Canada

+1 250 286-0022
www.cermaq.ca

Infrastructure Mitigation

- Receiving site will be set up with sea lice skirts deployed (10m depth) and 25m deep bubble curtains and diffusers running.
- Skirts and bubble curtains will be running for 2 weeks prior to smolt entry.



Therapeutant Mitigation

- EDR applications for Imvixa (Lufenuron) have been submitted for [REDACTED] smolts coming from Boot Lagoon and Oceans Hatchery. Once made available this product will be used on the earliest possible smolt transports.
- For this product to be available for the first smolts it must be available by August 15th. If available after August 15th the product will still be used but on subsequent smolt entries.
- If Lufenuron is not available for the first smolts we will take the added precaution of treating with SLICE in the hatchery those smolts that will not receive Lufenuron. This is routine on the East Coast of Canada with good results preventing larval lice settlement. Our SLICE bioassays from Tofino indicate that younger life stages are still sensitive to SLICE even when adults of the same population are highly resistant.

Further Consideration

- Smolts have already been delayed 10 days to meet the August 29th entry and cannot be delayed any further. Further delays would result in significant fish welfare issues in the hatcheries due to density and saprolegniosis. Fish have already been triggered for entry via photoperiod manipulation.



Cermaq Canada Ltd

Email: [REDACTED]

CC: Melanie McNabb (Governance Coordinator) SalmonITC@dfo-mpo.gc.ca

s.19(1)

s.20(1)(b).

Hedderson, Lisa

From: Taekema, Bernie John
Sent: August-13-18 2:28 PM
To: McCorquodale, Brenda; Hedderson, Lisa
Subject: FW: Aquaculture Harmonization Minutes & Next Meeting [REDACTED] - Sept. 12th
Attachments: Aqua Harmonization Meeting Minutes - May 8, 2018.doc

From: Fettes, Lesley FLNR:EX [<mailto:Lesley.Fettes@gov.bc.ca>]
Sent: July-24-18 4:22 PM
To: McCorquodale, Brenda; Kosmider, Gabrielle; Taekema, Bernie John; Tetarenko, Diane FLNR:EX; Mackie, John; Walker, Monica; Johnson, Jim FLNR:EX
Subject: RE: Aquaculture Harmonization Minutes & Next Meeting [REDACTED] - Sept. 12th

Hi Folks,
My apologies for the long delay getting the minutes out from our May meeting. Please send me any changes that you note.

Also a reminder that we are booked for September 12 for a meeting [REDACTED]

If possible, I would like to recommend that we incorporate a PRT face-to-face meeting that afternoon.

Thanks,
Lesley
Hi Nichole,
This meeting will likely be re-scheduled, but please plan to attend on my behalf if it's during your acting term. If not please pass along the invite to Jim.

Thanks!
Lesley

Lesley Fettes
Section Head, Aquaculture
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
phone: (250) 897-7541

From: Walker, Monica [<mailto:Monica.Walker@dfo-mpo.gc.ca>]
Sent: Wednesday, May 9, 2018 8:32 AM
To: McCorquodale, Brenda; Fettes, Lesley FLNR:EX
Cc: Kosmider, Gabrielle; Tetarenko, Diane FLNR:EX
Subject: Aquaculture Harmonization Meeting [REDACTED] - Sept. 12th

Hello Everyone – Please note that I have booked the Aquaculture Boardroom at 1965 Island Diesel Way from 9 am to 1 pm on Sept. 12th for the Aquaculture Harmonization Meeting [REDACTED]

Cheers.

s.19(1)

Monica

Monica Walker
Aquaculture Management Coordinator | Coordonnatrice de la gestion de l'aquaculture
Aquaculture Management Division | Gestion de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada

1965 Island Diesel Way
Nanaimo, BC | C.-B. V9S 5W8
Telephone | téléphone: (250) 754-0408
Cell | cellulaire: [REDACTED]
Fax | télécopier: (250) 754-0391
E-mail | courriel: monica.walker@dfo-mpo.gc.ca

s.16(2)(c)

AQUACULTURE HARMONIZATION WORKING GROUP MEETING

February 13 2018 – 1:00pm – 3:00pm

Aqua Boardroom 1965 Island Diesel Way, Nanaimo, BC

Minutes

MFLNRO	DFO	TC
Diane Tetarenko	Monica Walker	John Mackie
Lesley Fettes	Gabrielle Kosmider	
Jim Johnson	Lisa Hedderson	
Jordan Wagner	Brenda M ^c Corquodale	
Marco Peemoeller		

1. Review of Agenda

No additions

2. Review of Action Items from November 2017 Harmonization Working Group Meeting

Item	Status
ACTION: Gabrielle & Diane to communicate around ensuring referrals are sent to Environment Canada on applications in the marine environment.	Complete
ACTION REMAINING: Gabrielle & Diane still need to reach out to other regions	
Lesley, Brenda & Gabrielle to discuss Baynes Sound Terms of reference & flowsheet for PRT to be sent to attendees	Complete Complete
Update attendance list for Harmonization meeting – add Monica & Susan	Complete – however email list for minutes needs to be updated (to be double-checked)
Update communication with geoduck applicants	Complete – no longer necessary (since geoduck are now through pre-screen)
Transport Canada to provide an explanation of how...	

3. Federal Update – DFO (B. M^cCorquodale) & Transport Canada (John Mackie)

TC:

- NPA changed to CNWA – currently before House, should be in force by late 2018
- Management has been working on 'vessel of concern' to be incorporated into legislation that will superseded *Canada Shipping Act* (?)

- Hired quite a few new people – 7 people hired into the same position as John, succession management and capacity to deal with legislative changes.
- The most significant changes to the legislation will be:
 - o consultation with FN will become part of the legislation;
 - o scope of waterways is changing – there will still be a list of designated waterways, adding waterways to the list will be easier (and will give more concern to FN interests).
- There is a new site marking regime to standardize how aquaculture facilities are marked for navigation. East Coast industry has driven these standards. The required spacing for buoys is changing and there will be more discretion for the decision maker in determining the number and spacing of the buoys.
 - o Shellfish – bottom culture will require surface marking at certain spacing, possibly information buoys.

DFO:

- Aquaculture Act – consultation is ongoing
- Stakeholder meetings are occurring on proposed changes to the *Fisheries Act* – biggest changes are to habitat provisions (provisions are proposed to be similar to previous versions of the Act). Also more ability to partner with FNs.
- Strategic Salmon Health initiative – can Chinook Salmon contract jaundice...etc
- Norovirus outbreak related to shellfish (5 closures, 200 illnesses), the outbreak is currently winding down, 2nd year in a row. Industry is pointing to herring industry and vessel discharge.
- SF AMAC – TC explained mandate, lots of discussion
- FF issues are varied at the moment:
 - o protests last two weekends;
 - o Operation Virus Hunter arriving soon;
 - o worker safety is a key concern, industry to use some information buoys to provide some warnings, alternative is vessel operation restriction regulation (but not likely workable).
 - o There are emerging sea lice issues occurring on farm site on the west coast of Vancouver Island. Lots of discussion going on regarding Integrated Pest Management .
 - o Pest management – industry is concerned with requirements from provincial Ministry of Environment – meeting coming up on May 11.
 - o Glass sponge reef video circulating.
- Geoduck screening & biotoxin monitoring has been addressed
- No closer to solving issues with non-classified waters (related to CSSP requirements).

4. Provincial Update – FLNRORD (D. Tetarenko & L. Fettes)

FCBC:

- Nothing to update – very quiet re: new applications

Aquaculture program:

- We are fully staffed – yay!
- Broughton – lots of attention from the public. There are conversations occurring on a Government-to-Government basis between the Province and Broughton First Nations.
- Baynes Sound – no new updates.
- UNDRIP – Province has committed to implement UNDRIP.

5. Status Updates

Project Review Team (PRT) Update

- Jim & Bernie have been communicating more frequently on FF apps, and that has been useful
- John: process works well enough, TC needs to gather information from 3rd parties as early as possible in the process.
- FCBC: sometimes comments on mapping are different from different agencies

Discussion about mapping needs of each agency:

- TC: may look at different applications with a different lens – sometimes John has knowledge of a particular waterway, or is familiar with a particular proponent
- DFO now has software and systems that provide for GIS work, looking into options for how best to use this capability (currently staff not trained)

ACTION: Susan to remind PRT members: If you are in contact with the applicant and receive additional information post-PRT, please share this information, where information is gathered post-PRT to share this information

ACTION: Add discussion about future updates to app forms and guidebooks to fall or winter harmonization meeting agenda.

6. Upcoming public events

- WWF & Islands Trust are hosting a Baynes Sound Ecosystem Forum – Brenda M & Shelley J & Lesley F are attending

ACTION Brenda to send information on the Baynes Sound Forum to John Mackie

- Seafood festival in June – DFO will have a booth

7. DFO FTP site

- This is an avenue for information sharing between DFO & FLNR
- John: has had struggles with FTP sites due to IT limitations with TC. Will continue to obtain information through other channels if necessary.

8. Roundtable

FLNR – We sent a letter to intertidal shellfish tenure holders asking them to shepherd-hook any rebar being used on site and to ensure that their tenures are kept in a 'safe, clean and sanitary' condition (this is wording that exists in the tenure document). This was done after concerns were raised by upland owners about safety for swimming and use of small boats. We had discussed this with John Mackie in fall 2017.

ACTION: Jordan W will send a copy of the letter to DFO, TC & BCSGA.

Next meeting in September:

ACTION: Potluck for next meeting, 10-12 followed by lunch

Next Meeting Date: September 12, 2018

Location: Island Diesel Way

Lead: DFO



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Aquaculture Monitoring Program

Theraesa Coyle

Aquatic Biologist, Ecosystem Sciences Division

August 15, 2018



Canada

Available at
https://www.dropbox.com/sh/yifi3x1qz9pmsz1/AAAdjEN0uJt4uD7DYU0dVJdqa/2018/Aug%2015%202018?dl=0&preview=AMP+Pacific_Aug+2018_CRT+Meeting.pdf&subfolder_nav_tracking=1

Canada

**Pages 331 to / à 333
are withheld pursuant to section
sont retenues en vertu de l'article**

68(a)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

McNabb, Melanie

From: [REDACTED]
Sent: August-16-18 8:29 AM
To: Waddington, Zac
Cc: [REDACTED] Manchester, Howie; salmonITC / CITsaumon (DFO/MPO); [REDACTED]
Subject: *Confidential: RE: RE: ITC applications #S202 and S203 - ON HOLD
Attachments: 2018-29398_Conditions of release_IMVIXA_15AUG2018.pdf; 2018-29397_Conditions of release_IMVIXA_15AUG2018.pdf

Hello Zac,

We received the EDR for the Imvixa yesterday as hoped. Both Boot Lagoon and Ocean Farms Hatcheries will be commencing treatment of all fish scheduled for transport today.

Please find attached the EDR & associated conditions which include additional reporting to you.

Thanks



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
To: [REDACTED] "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
Cc: [REDACTED] "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>, [REDACTED]
Date: 14/08/2018 06:26 PM
Subject: RE: *Confidential: RE: ITC applications #S202 and S203 - ON HOLD

Thank you very much for providing that documentation of your planned stocking and lice mitigation activities in Tofino north. I have been in contact with the EDR department of Health Canada in order to try and expedite the approval process for Imvixa such that all smolts being restocked into Clayoquot would be able to be treated and thereby have efficacious lice mitigation prior to arrival of Cermaq's hydrolicer.

s.19(1)

I am currently away from the office [REDACTED], but I would like to try and arrange a time to discuss the alternative mitigation strategies suggested by Cermaq if the EDR for Imvixa fails to come through in time. I will be available on Friday for a discussion, and by then we should know if the EDR has arrived in time for the Imvixa treatment to occur for all smolts to be transferred to Tofino north.

Zac

From: [REDACTED]
Sent: August-10-18 5:01 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle; [REDACTED] Waddington, Zac
Subject: *Confidential: RE: ITC applications #S202 and S203 - ON HOLD

Hello Zac,

Please find attached our Mitigation Plan for Sea Lice during the stocking of our Marine facilities in our Tofino North Operations.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From: "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
To: [REDACTED], "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
Cc: [REDACTED], "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>, "Charbonneau, Michelle" <Michelle.Charbonneau@dfo-mpo.gc.ca>, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Date: 02/08/2018 03:14 PM
Subject: RE: ITC applications #S202 and S203 - ON HOLD

Hello [REDACTED]

As discussed, we'll be putting these applications on hold pending further information on updated sea lice management strategies for your Clayoquot sites. In the meantime, we will complete the review of fish health records and this week's site visit so that we are in a position to move forward with our assessment once those details have been provided.

Thank you,
Melanie

s.19(1)

Melanie McNabb
Governance Coordinator / Coordinatrice de la gouvernance
Fisheries and Oceans Canada, Pacific Region / Pêche et Océans Canada, région du pacifique
200 - 401 rue Burrard St., Vancouver, BC V6C 3S4
Tel. / tél.: (604) 666-6894
Fax / téléc.: (604) 666-1076
e-mail / courriel: melanie.mcnabb@dfo-mpo.gc.ca

From: [REDACTED]
Sent: July-20-18 4:59 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle
Subject: *Confidential: Application for transfer of Smolts from Ocean Farms (#180) to Marine Facilities - Dixon (#234), Millar (#1507) & Ross (#526)

Hello,

Please find attached an applications for a licences to transfer fish from our Ocean Farms Hatchery to our marine facilities Dixon, Millar & Ross Pass (Clayoquot Region).

Should you have any questions please let me know.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

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notify the sender immediately by return e-mail and then delete this message.

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Health
Canada

Santé
Canada

**EMERGENCY DRUG RELEASE AUTHORIZATION /
AUTORISATION DE DISTRIBUTION DE MÉDICAMENTS D'URGENCE**

s.19(1)

VETERINARY DRUGS DIRECTORATE / DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES

s.20(1)(b)

Holland Cross Complex, Tower A, Ground Floor, Address Locator : 3000A

14-11 Holland Avenue, Ottawa, ON K1A 0K9

Tel. / Tél. : 613 240-3916 Fax / Télécopieur : 613 946-1125

hc.edr-dmu.sc@canada.ca

MANUFACTURER - SUPPLIER / FABRICANT - DISTRIBUTEUR Elanco Animal Health, Div. of Eli Lilly Canada Inc. Suite 120 Guelph, ONT, N1G 4T2, CAN	TEL/TÉL : [REDACTED] FAX/TÉLÉCOPIEUR : Use email CONTACT / PERSONNE RESSOURCE [REDACTED]
--	--

Pursuant to Section C.08.010 of the Food and Drugs Regulations, and notwithstanding Section C.08.002, the above-noted manufacturer is authorized to sell the following drug, in the quantity and under the conditions specified, to the veterinary practitioner named herein. / En vertu de l'article C.08.010 du Règlement sur les aliments et les drogues et nonobstant l'article C.08.002, le fabricant mentionné ci-dessus est autorisé à vendre le médicament suivant dans les quantités et selon les conditions spécifiées au vétérinaire nommé ci-dessous.

DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%	ACTIVE INGREDIENT(S) / INGRÉDIENT(S) ACTIF(S) lufenuron
---	---

QUANTITY / QUANTITÉ 30 kg

DOSAGE / POSOLOGIE 5mg/kg biomass, orally administered in feed for seven days.

VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRINAIRE [REDACTED] Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2	TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042 EMAIL/COURRIEL : [REDACTED]
--	--

VETERINARY SITUATION, DISEASE, DIAGNOSIS / JUSTIFICATION DE L'UTILISATION, MALADIE, DIAGNOSTIC
In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Dixon Bay, Millar Channel and Bawden Point sites

SPECIES / ESPÈCE(S)
Atlantic Salmon / Saumon de l'Atlantique

NUMBER OF ANIMALS, AGE, WEIGHT / NOMBRE D'ANIMAUX, ÂGE, POIDS
2019 SW, [REDACTED] avg weight 89g; total biomass [REDACTED] as per preliminary prescription dated 12July2018.

**ANIMAL PATIENT NAME AND OWNER'S NAME or PRODUCTION SITE AND PRODUCER'S NAME /
NOM DE L'ANIMAL ET NOM DU PROPRIÉTAIRE ou SITE DE PRODUCTION ET NOM DU PRODUCTEUR**
Cermaq Canada Ltd. Oceans Hatchery. Pens TBD

CONDITIONS It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals. Treated fish must not be slaughtered for use in food for at least 350 days after the latest treatment with this drug. A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption. Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended. The VDD and the British Columbia DFO aquaculture authority, Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Dixon Bay, Millar Channel or Bawden Point. Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence. All unused feed must be destroyed following treatment. Please see the attached letter for complete conditions of release.

The above-named practitioner has complied with the requirements of Section C.08.010 of the Food and Drugs Regulations to obtain this drug for use according to his / her professional responsibility. In so doing, the practitioner has agreed to report to you and to the Veterinary Drugs Directorate, the results of this emergency use, including efficacy, safety in the intended species and any adverse reactions observed. These results must be submitted before any further authorization can be given. Pursuant to subsection C.08.011 (2) of the said Regulations, this sale is exempt from the provisions of the Food and Drugs Act and Regulations. / Le praticien nommé ci-dessus s'est conformé aux exigences de l'article C.08.010 du Règlement sur les aliments et les drogues afin de se procurer le médicament pour utilisation en accord avec ses responsabilités professionnelles. Ce faisant, le praticien a accepté de rendre compte, au fabricant et à la Direction des médicaments vétérinaires, des résultats de cette utilisation d'urgence, incluant l'efficacité, l'innocuité pour l'espèce visée et toute réaction indésirable observée. Ces résultats doivent être soumis avant que toute autre autorisation ne puisse être délivrée. En vertu du paragraphe C.08.011(2) de la Loi en question, cette vente n'est pas visée par les dispositions de Loi et du Règlement sur les aliments et drogues.

EDR NO. / No DE DMU EDR 2018-29397	NON <input type="checkbox"/> FOOD <input checked="" type="checkbox"/>
--	---

VDD AUTHORITY SIGNATURE / SIGNATAIRE AUTORISÉ DE LA DMV : Dr. Julie Burke, Acting EDR Officer, DVM / Agente intérimaire d'autorisation de médicaments d'urgence	Date : 2018-08-15
---	--------------------------

02.11.22

PLEASE NOTE : THIS FACSIMILE IS AN OFFICIAL AUTHORIZATION. IF YOU HAVE PROBLEMS WITH THIS AUTHORIZATION OR TRANSMISSION, PLEASE CONTACT THIS DIRECTORATE.

NOTE : CE FACSIMILÉ CONSTITUE UNE AUTORISATION OFFICIELLE. SI VOUS ÉPROUVEZ DES PROBLÈMES RELATIFS À CETTE AUTORISATION, CETTE TRANSMISSION, VEUILLEZ CONTACTER LA DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES.

000338

EDR CONDITIONS OF RELEASE: EDR 2018-29398

It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals.

Treated fish must not be slaughtered for use in food for at least **350 days** after the latest treatment with this drug.

A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption.

Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended.

The VDD and the British Columbia - DFO aquaculture authority, Dr Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Dixon Bay, Millar Channel or Bawden Point.

Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence.

All unused feed must be destroyed following treatment.

All unused drug must be returned to the manufacturer following treatment.

At the hatchery, do not feed excess diet containing lufenuron.

At the cages housing the treated fish, allow at least 1 year following treatment with lufenuron to allow natural systems to recover.

Furthermore:

1. This drug product may cause sensitisation by skin contact. Avoid direct contact with skin or eyes.
2. Operators mixing and handling the product should wear protective gloves, glasses and masks. Do not eat, drink or smoke when handling this product and medicated feed. Wash hands thoroughly with soap and water after handling. In case of accidental eye or skin contact, immediately rinse thoroughly with water. In case of accidental ingestion seek medical assistance immediately.
3. The lipophilic nature of lufenuron raises environmental concerns related specifically to the disposal of solid waste (feces and unconsumed feed) that will be produced during the hatchery portion of the production cycle. In order to prevent risk to the environment as a result of the use of Imvixa during the emergency drug release, it is recommended to minimize the release of waste water and solid waste from the Boot Lagoon Hatchery facilities to fish bearing waters and to follow provincial and municipal laws for the disposal of solid waste and waste water. Waste water and solid waste should

be collected, contained, and treated to prevent release to the environment. Solid waste and manure should be disposed of appropriately (e.g. biodigester, incinerator, or solid waste landfill). It is recommended to use a settling pond or lagoon to receive and contain any waste water.

4. Yearly benthic sampling should be collected and sent for drug residue analysis.
5. A follow-up report and answers to the following questions should be submitted to the VDD within 12 months of the Authorization Letter:

1. Hatchery Site name:
2. Number of salmon treated:
3. Average weight of salmon treated:
4. Dates (day/month/year) and total number of days medicated feed was offered:
5. Quantity of IMVIXA used:
6. Quantity of IMVIXA returned to Elanco:
7. Fresh water phase:
 - a. Daily and/or weekly mortality during treatment and post-treatment prior to transfer
 - b. Comparison to industry average
8. Transfer phase:
 - a. Mortality during transfer phase
 - b. Comparison to industry average
9. Salt water phase:
 - a. Name of Marine Site
 - b. Daily and/or weekly mortality Up to and including 4 weeks post transfer
 - c. Comparison to industry average
10. An estimation of the duration of activity, including sea lice counts for the site

Please note, that in June 2015 the Aquaculture Activities Regulations (AAR) of the Fisheries Act came into effect to manage potential impacts of fish pathogen and pest treatments (drugs and pesticides) to fish and fish habitat related to aquaculture activities. Part of this new regulatory regime includes a science-based research and advisory process to examine the feasibility, and need for risk-based post-deposit monitoring and remedial actions for drugs and pesticides including the implementation of environmental monitoring and/or environmental guidelines to address unacceptable risk. As a result, this substance may be subject to further regulatory requirements in the future.

EMERGENCY DRUG RELEASE AUTHORIZATION /
AUTORISATION DE DISTRIBUTION DE MÉDICAMENTS D'URGENCE

s.19(1)
 s.20(1)(b)

VETERINARY DRUGS DIRECTORATE / DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES
 Holland Cross Complex, Tower A, Ground Floor, Address Locator : 3000A
 14-11 Holland Avenue, Ottawa, ON K1A 0K9
 Tel. / Tél. : 613 240-3916 Fax / Télécopieur : 613 946-1125
 hc.edr-dmu.sc@canada.ca

MANUFACTURER - SUPPLIER / FABRICANT - DISTRIBUTEUR Elanco Animal Health, Div. of Eli Lilly Canada Inc. Suite 120 Guelph, ONT, N1G 4T2, CAN		TEL/TÉL : [REDACTED] FAX/TÉLÉCOPIEUR : Use email CONTACT / PERSONNE RESSOURCE [REDACTED]
Pursuant to Section C.08.010 of the Food and Drugs Regulations, and notwithstanding Section C.08.002, the above-noted manufacturer is authorized to sell the following drug, in the quantity and under the conditions specified, to the veterinary practitioner named herein. / En vertu de l'article C.08.010 du Règlement sur les aliments et les drogues et nonobstant l'article C.08.002, le fabricant mentionné ci-dessus est autorisé à vendre le médicament suivant dans les quantités et selon les conditions spécifiées au vétérinaire nommé ci-dessous.		
DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%		ACTIVE INGREDIENT(S) / INGRÉDIENT(S) ACTIF(S) lufenuron
QUANTITY / QUANTITÉ 30 kg		
DOSAGE / POSOLOGIE 5mg/kg biomass, orally administered in feed for seven days.		
VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRINAIRE [REDACTED] Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2		TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042 EMAIL/COURRIEL : [REDACTED]
VETERINARY SITUATION, DISEASE, DIAGNOSIS / JUSTIFICATION DE L'UTILISATION, MALADIE, DIAGNOSTIC In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Dixon Bay, Millar Channel and Bawden Point sites.		
SPECIES / ESPÈCE(S) Atlantic Salmon / Saumon de l'Atlantique		
NUMBER OF ANIMALS, AGE, WEIGHT / NOMBRE D'ANIMAUX, ÂGE, POIDS 2019 SW, [REDACTED] avg weight 88 g; total biomass [REDACTED] as per preliminary prescription dated 12July2018.		
ANIMAL PATIENT NAME AND OWNER'S NAME or PRODUCTION SITE AND PRODUCER'S NAME / NOM DE L'ANIMAL ET NOM DU PROPRIÉTAIRE ou SITE DE PRODUCTION ET NOM DU PRODUCTEUR Cermaq Canada Ltd. Boot Lagoon Hatchery. Pens TBD		
CONDITIONS It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals. Treated fish must not be slaughtered for use in food for at least 350 days after the latest treatment with this drug. A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption. Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended. The VDD and the British Columbia provincial aquaculture authority, Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Dixon Bay, Millar Channel or Bawden Point. Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence. All unused feed must be destroyed following treatment. Please see the attached letter for complete conditions of release.		
The above-named practitioner has complied with the requirements of Section C.08.010 of the Food and Drugs Regulations to obtain this drug for use according to his / her professional responsibility. In so doing, the practitioner has agreed to report to you and to the Veterinary Drugs Directorate, the results of this emergency use, including efficacy, safety in the intended species and any adverse reactions observed. These results must be submitted before any further authorization can be given. Pursuant to subsection C.08.011 (2) of the said Regulations, this sale is exempt from the provisions of the Food and Drugs Act and Regulations. / Le praticien nommé ci-dessus s'est conformé aux exigences de l'article C.08.010 du Règlement sur les aliments et les drogues afin de se procurer le médicament pour utilisation en accord avec ses responsabilités professionnelles. Ce faisant, le praticien a accepté de rendre compte, au fabricant et à la Direction des médicaments vétérinaires, des résultats de cette utilisation d'urgence, incluant l'efficacité, l'innocuité pour l'espèce visée et toute réaction indésirable observée. Ces résultats doivent être soumis avant que toute autre autorisation ne puisse être délivrée. En vertu du paragraphe C.08.011(2) de la Loi en question, cette vente n'est pas visée par les dispositions de Loi et du Règlement sur les aliments et drogues.		
EDR NO. / No DE DMU EDR 2018-29398		NON <input type="checkbox"/> FOOD <input checked="" type="checkbox"/>
VDD AUTHORITY SIGNATURE / SIGNATAIRE AUTORISÉ DE LA DMU : Dr. Julie Burke, Acting EDR Officer, DVM / Agente intérimaire d'autorisation de médicaments d'urgence		Date : 2018-08-15
02.11.22		
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EDR CONDITIONS OF RELEASE: EDR 2018-23297

It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals.

Treated fish must not be slaughtered for use in food for at least **350 days** after the latest treatment with this drug.

A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption.

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The VDD and the British Columbia - DFO aquaculture authority, Dr Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Dixon Bay, Millar Channel or Bawden Point.

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All unused drug must be returned to the manufacturer following treatment.

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At the cages housing the treated fish, allow at least 1 year following treatment with lufenuron to allow natural systems to recover.

Furthermore:

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2. Operators mixing and handling the product should wear protective gloves, glasses and masks. Do not eat, drink or smoke when handling this product and medicated feed. Wash hands thoroughly with soap and water after handling. In case of accidental eye or skin contact, immediately rinse thoroughly with water. In case of accidental ingestion seek medical assistance immediately.
3. The lipophilic nature of lufenuron raises environmental concerns related specifically to the disposal of solid waste (feces and unconsumed feed) that will be produced during the hatchery portion of the production cycle. In order to prevent risk to the environment as a result of the use of Imvixa during the emergency drug release, it is recommended to minimize the release of waste water and solid waste from the Oceans Hatchery facilities to fish bearing waters and to follow provincial and municipal laws for the disposal of solid waste and waste water. Waste water and solid waste should

be collected, contained, and treated to prevent release to the environment. Solid waste and manure should be disposed of appropriately (e.g. biodigester, incinerator, or solid waste landfill). It is recommended to use a settling pond or lagoon to receive and contain any waste water.

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1. Hatchery Site name:
2. Number of salmon treated:
3. Average weight of salmon treated:
4. Dates (day/month/year) and total number of days medicated feed was offered:
5. Quantity of IMVIXA used:
6. Quantity of IMVIXA returned to Elanco:
7. Fresh water phase:
 - a. Daily and/or weekly mortality during treatment and post-treatment prior to transfer
 - b. Comparison to industry average
8. Transfer phase:
 - a. Mortality during transfer phase
 - b. Comparison to industry average
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 - a. Name of Marine Site
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 - c. Comparison to industry average
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Please note, that in June 2015 the Aquaculture Activities Regulations (AAR) of the Fisheries Act came into effect to manage potential impacts of fish pathogen and pest treatments (drugs and pesticides) to fish and fish habitat related to aquaculture activities. Part of this new regulatory regime includes a science-based research and advisory process to examine the feasibility, and need for risk-based post-deposit monitoring and remedial actions for drugs and pesticides including the implementation of environmental monitoring and/or environmental guidelines to address unacceptable risk. As a result, this substance may be subject to further regulatory requirements in the future.

McNabb, Melanie

From: Waddington, Zac
Sent: August-16-18 10:58 AM
To: [REDACTED]
Cc: [REDACTED] Manchester, Howie; salmonITC / CITsaumon (DFO/MPO); [REDACTED]
Subject: RE: *Confidential: RE: RE: ITC applications #S202 and S203 - ON HOLD

Very glad to hear this was able to arrive in time for the treatment to occur. I view the use of this product as sufficient mitigation for sea lice concerns and will review the transfer applications in detail and expect to have a recommendation for the ITC very shortly.

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

From: [REDACTED]
Sent: August-16-18 8:29 AM
To: Waddington, Zac
Cc: [REDACTED]; Manchester, Howie; salmonITC / CITsaumon (DFO/MPO); [REDACTED]
Subject: *Confidential: RE: RE: ITC applications #S202 and S203 - ON HOLD

Hello Zac,

We received the EDR for the Imvixa yesterday as hoped. Both Boot Lagoon and Ocean Farms Hatcheries will be commencing treatment of all fish scheduled for transport today.

Please find attached the EDR & associated conditions which include additional reporting to you.

Thanks



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

s.19(1)

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
To: [REDACTED], "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
Cc: [REDACTED], "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>, [REDACTED]
Date: 14/08/2018 06:26 PM
Subject: RE: *Confidential: RE: ITC applications #S202 and S203 - ON HOLD

Thank you very much for providing that documentation of your planned stocking and lice mitigation activities in Tofino north. I have been in contact with the EDR department of Health Canada in order to try and expedite the approval process for Imvixa such that all smolts being restocked into Clayoquot would be able to be treated and thereby have efficacious lice mitigation prior to arrival of Cermaq's hydrolicer.

I am currently away from the office [REDACTED] but I would like to try and arrange a time to discuss the alternative mitigation strategies suggested by Cermaq if the EDR for Imvixa fails to come through in time. I will be available on Friday for a discussion, and by then we should know if the EDR has arrived in time for the Imvixa treatment to occur for all smolts to be transferred to Tofino north.

Zac

From: [REDACTED]
Sent: August-10-18 5:01 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle; [REDACTED] Waddington, Zac
Subject: *Confidential: RE: ITC applications #S202 and S203 - ON HOLD

Hello Zac,

Please find attached our Mitigation Plan for Sea Lice during the stocking of our Marine facilities in our Tofino North Operations.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

s.19(1)

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

Cermaq.ca [Facebook](#) [Twitter](#)

From: "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
To: [REDACTED], "salmonITC / CITsaumon (DFO/MPO)" <SalmonITC@dfo-mpo.gc.ca>
Cc: [REDACTED], "Manchester, Howie" <Howie.Manchester@dfo-mpo.gc.ca>, "Charbonneau, Michelle" <Michelle.Charbonneau@dfo-mpo.gc.ca>, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Date: 02/08/2018 03:14 PM
Subject: RE: ITC applications #S202 and S203 - ON HOLD

Hello [REDACTED]

As discussed, we'll be putting these applications on hold pending further information on updated sea lice management strategies for your Clayoquot sites. In the meantime, we will complete the review of fish health records and this week's site visit so that we are in a position to move forward with our assessment once those details have been provided.

Thank you,
Melanie

Melanie McNabb
Governance Coordinator / Coordinatrice de la gouvernance
Fisheries and Oceans Canada, Pacific Region / Pêche et Océans Canada, région du pacifique
200 - 401 rue Burrard St., Vancouver, BC V6C 3S4
Tel. / tél.: (604) 666-6894
Fax / téléc.: (604) 666-1076
e-mail / courriel : melanie.mcnabb@dfo-mpo.gc.ca

From: [REDACTED]
Sent: July-20-18 4:59 PM
To: salmonITC / CITsaumon (DFO/MPO)
Cc: [REDACTED] Manchester, Howie; Charbonneau, Michelle
Subject: *Confidential: Application for transfer of Smolts from Ocean Farms (#180) to Marine Facilities - Dixon (#234), Millar (#1507) & Ross (#526)

Hello,

Please find attached an applications for a licences to transfer fish from our Ocean Farms Hatchery to our marine facilities Dixon, Millar & Ross Pass (Clayoquot Region).

Should you have any questions please let me know.

Many Thanks,



CERMAQ

Phone +1 250-286-0022
Direct +1 250-286-0022 ext. [REDACTED]
Mobile [REDACTED]

Cermaq Canada Ltd.
#203-919 Island Highway
V9W 2C2 Campbell River, BC, Canada

s.19(1)

Cermaq.ca [Facebook](#) [Twitter](#)

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No information has been removed or severed from this page

Shaw, Kerra

From: Shaw, Kerra
Sent: Monday, August 20, 2018 12:34 PM
To: Waddington, Zac; Jones, Simon
Cc: Paylor, Adrienne
Subject: RE: Sea lice management and resistance in Clayoquot Sound

I did not tackle this while you were away, Zac. So I'd assume no one from aquaculture management has responded.

Kerra

From: Waddington, Zac
Sent: Tuesday, August 14, 2018 5:10 PM
To: Jones, Simon; Shaw, Kerra
Cc: Paylor, Adrienne
Subject: RE: Sea lice management and resistance in Clayoquot Sound

Was anyone able to get back to this request? It's virtually a "yes" to all the questions posed. If no one has responded I'm happy to give him a shout.

Zac

From: Jones, Simon
Sent: August-07-18 11:05 AM
To: Shaw, Kerra
Cc: Waddington, Zac; Paylor, Adrienne
Subject: FW: Sea lice management and resistance in Clayoquot Sound

Hi Kerra,

Just saw the out of office from Zac and Adrienne.

Cheers, Simon

From: Jones, Simon
Sent: August-07-18 11:04 AM
To: Waddington, Zac
Cc: Paylor, Adrienne
Subject: FW: Sea lice management and resistance in Clayoquot Sound

Hi Zac,

I haven't seen recent bio-assay data from farms in Clayoquot Sd, and cannot provide [REDACTED] with an informed answer to his question.

In any event, your shop will likely have additional information to address this question.

Let me know if you require my input.

s.19(1)

Best, Simon

Simon R.M. Jones
Acting Section Head AAH

*Aquatic Animal Health Section
Pacific Biological Station
Fisheries and Oceans Canada
3190 Hammond Bay Road
Nanaimo, British Columbia
V9T 6N7, Canada*

Tel: 250 729 8351
Fax: 250 756 7053
E-mail: simon.jones@dfo-mpo.gc.ca

From: [REDACTED]
Sent: August-06-18 1:34 PM
To: Jones, Simon
Subject: Sea lice management and resistance in Clayoquot Sound

Hi Simon,

My name is [REDACTED] the Cedar Coast Field Station, situated on Vargis Island here in Clayoquot Sound. This spring we were conducting juvenile salmon and sealice monitoring during the juvenile salmon out migration. The outbreak seen on farms in Clayoquot Sound this year also seemed to coincided with high abundance and prevalence of sea lice on the wild fry and smolts we were assessing in the region. We had a small survey this year but the fish we did find had lice loads much higher than was reported for juvenile salmon in the region during previous assessments.

There has been lots of talk about the use of hydrogen peroxide to treat sea lice on the Cermaq farms here, including discussing resistance to slice developing. I have heard lots of rumblings and rumours mentioning resistance developing but I have not heard anything from an official source. It is mentioned in one of Cermaq's permit applications for use of hydrogen peroxide around Campbell river, but they do not mention the location in which slice resistance lice were found. Is there any concrete evidence of slice resistance forming in BC or is the treatment with hydrogen peroxide here in Clayoquot Sound an attempt to reduce the potential for resistance by using an array of treatments?

All the best,

[REDACTED]

--

[REDACTED]
Cedar Coast Field Station
[REDACTED]

s.19(1)

Luedke, Wilf

From: [REDACTED]
Sent: August-23-18 11:46 AM
To: [REDACTED]
Subject: Draft Aug 15 Meeting Minutes
Attachments: Clayoquot Sound Roundtable Aug 15 2018 Draft Minutes.doc; AMP Pacific_Aug 2018
_CRT Meeting.pdf

Hello Clayoquot Salmon Roundtable,

Please find attached the draft minutes from the meeting on Aug. 15.

Some follow up discussions have been had on Wilf Rock, and these are still in progress. An update will be sent soon.

Also attached is the presentation that was made by Theraesa Coyle.

A separate email was sent with an Outlook invite to the next meeting on Sept. 26, 10am at Tin Wis. Thank you in advance for marking your calendars. Please send any agenda items you have as they arise.

[REDACTED]

[REDACTED]
West Coast Aquatic
Cell [REDACTED]
www.westcoastaquatic.ca
www.roundtables.westcoastaquatic.ca
<https://marineguide.ca>

s.19(1)

Available at

https://www.dropbox.com/sh/yifi3x1qz9pmsz1/AAAdjEN0uJt4uD7DYU0dVJdqa/2018/Aug%2015%202018?dl=0&preview=Clayoquot+Sound+Roundtable+Aug+15+2018+Minutes.pdf&subfolder_nav_tracking=1



Clayoquot Salmon Roundtable

Clayoquot Salmon Roundtable Record of Meeting

Date: Aug. 15, 2018
Location: Tin Wis Resort, Tofino BC

Summary of Roundtable Action Items:



**Pages 352 to / à 361
are withheld pursuant to section
sont retenues en vertu de l'article**

68(a)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

Anderson, Shannon

From: [REDACTED]
Sent: August-30-18 11:31 AM
To: [REDACTED]
Subject: Revised Update from Cermaq
Attachments: Aug. 30.2018. Update Fortune Channel.Signed.pdf

Hello Clayoquot Salmon Roundtable,

Please disregard the email sent in the last hour re: the Cermaq update for the Fortune site and replace it with this one, which corrects an error in the first letter.

Thank you,

[REDACTED]

[REDACTED]
West Coast Aquatic
Cell [REDACTED]
www.westcoastaquatic.ca
www.roundtables.westcoastaquatic.ca
[https://marineguide.ca](http://marineguide.ca)

CERMAQ

August 30th, 2018

Dear Clayoquot Salmon Roundtable Member,

Anchored in our commitment to transparency, I wanted to share an update with you on what is happening at Cermaq Canada salmon farms in the Ahousaht Mahoulthea.

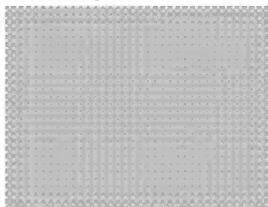
Cermaq has made the difficult decision, as a precautionary measure, to close down our Fortune Site early. We are doing this in support of fish welfare and effective Area Based Management of our Southern Region sites.

In order to close the site, we will need to remove the small fish that are currently on site. This will be done humanely and quickly over the weekend starting August 31st. These fish will then be sent to Vancouver for rendering.

Although this is an unfortunate development, we believe this is the responsible thing to do to uphold our fish welfare commitments, break the sea lice cycle, protect wild salmon in the area and most importantly operate responsibly in Ahousaht Territory and the Clayoquot Region. This site will now have an extended fallow until late 2019.

We are available to answer questions at any time,

Thank you,



Cermaq Canada Ltd.

203-919 Island Highway, Campbell River, BC
V9W 2C2 Canada

+1 250 266-0022 x [redacted]
www.cermaq.ca

Luedke, Wilf

From: [REDACTED]
Sent: August-30-18 10:39 AM
To: [REDACTED]
Subject: Update from Cermaq
Attachments: Aug. 30.2018. Update Fortune Channel.Signed.pdf

Hello Clayoquot Salmon Roundtable,

Please find attached an update from Cermaq re: their site at Fortune.

[REDACTED]
West Coast Aquatic
Cell : [REDACTED]
www.westcoastaquatic.ca
www.roundtables.westcoastaquatic.ca
<https://marineguide.ca>

s.19(1)

CERMAQ

August 30th, 2018

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We are available to answer questions at any time,

Thank you,



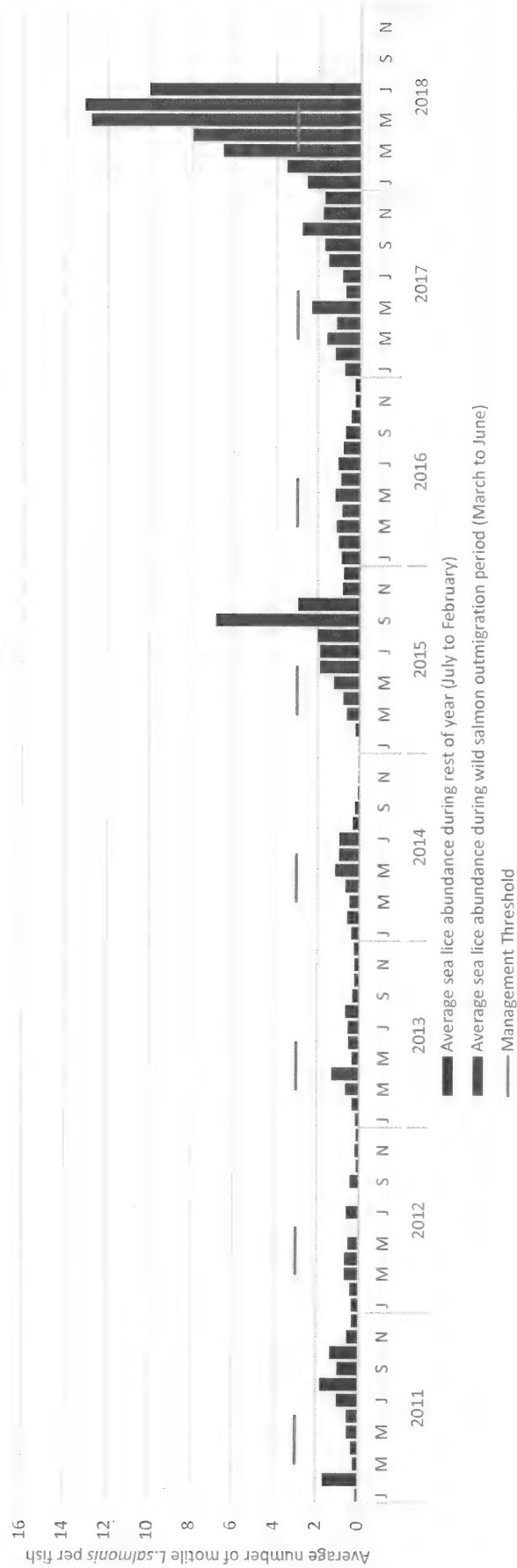
s.19(1)

Cermaq Canada Ltd.

203-919 Island Highway, Campbell River, BC
V9W 2C2 Canada

+1 250 286-0022 x 
www.cermaq.ca

Sea Lice Abundance at BC Salmon Farms in Fish Health Zone 2-3, 2011 to 2018



Zone de santé des poissons	Année	Mois	Seuil de gestion	Abondance moyenne du pou du poisson pendant la période de dévalaison du saumon sauvage (mars à juin)	Abondance moyenne du pou du poisson pendant le reste de l'année (de juillet à février)
Fish Health Zone	Year	Month	Management Threshold	Average sea lice abundance during wild salmon outmigration period (March to June)	Average sea lice abundance during rest of year (July to February)
2.3	2011	J			0.1
2.3		F			1.7
2.3		M	3	0.3	
2.3		A	3	0.3	
2.3		M	3	0.5	
2.3		J	3	0.6	
2.3		J			1.0
2.3		A			1.8
2.3		S			1.0
2.3		O			1.3
2.3		N			0.6
2.3		D			0.3
2.3	2012	J			0.3
2.3		F			0.4
2.3		M	3	0.7	
2.3		A	3	0.7	
2.3		M	3	0.5	
2.3		J	3		
2.3		J			0.6
2.3		A			
2.3		S			0.4
2.3		O			0.1
2.3		N			0.2
2.3		D			0.1
2.3	2013	J			0.2
2.3		F			0.4
2.3		M	3	0.6	
2.3		A	3	1.3	
2.3		M	3	0.3	
2.3		J	3	0.5	
2.3		J			0.5
2.3		A			0.7
2.3		S			0.3

2.3		O			0.2
2.3		N			0.2
2.3		D			0.3
2.3	2014	J			0.4
2.3		F			0.6
2.3		M	3	0.5	
2.3		A	3	0.7	
2.3		M	3	1.1	
2.3		J	3	1.0	
2.3		J			1.0
2.3		A			0.3
2.3		S			0.2
2.3		O			0.1
2.3		N			0.1
2.3		D			0.1
2.3	2015	J			0.1
2.3		F			0.2
2.3		M	3	0.6	
2.3		A	3	0.8	
2.3		M	3	1.3	
2.3		J	3	1.9	
2.3		J			1.9
2.3		A			2.0
2.3		S			6.9
2.3		O			3.0
2.3		N			0.8
2.3		D			0.8
2.3	2016	J			0.9
2.3		F			1.1
2.3		M	3	1.1	
2.3		A	3	0.9	
2.3		M	3	1.2	
2.3		J	3	0.9	
2.3		J			1.1
2.3		A			0.8
2.3		S			0.7
2.3		O			0.4
2.3		N			0.3
2.3		D			0.3
2.3	2017	J			0.8
2.3		F			1.2
2.3		M	3	1.6	
2.3		A	3	1.2	
2.3		M	3	2.3	
2.3		J	3	0.7	
2.3		J			0.9
2.3		A			1.5

2.3		S			1.7
2.3		O			2.8
2.3		N			1.8
2.3		D			1.7
2.3	2018	J			2.6
2.3		F			3.5
2.3		M	3	6.6	
2.3		A	3	8.0	
2.3		M	3	12.8	
2.3		J	3	13.1	
2.3		J			10.1
2.3		A			
2.3		S			
2.3		O			
2.3		N			
2.3		D			

McCorquodale, Brenda

From: Paylor, Adrienne
Sent: Wednesday, September 19, 2018 4:25 PM
To: McCorquodale, Brenda
Subject: FW: FYI media call on sea lice today

Whoops I mean Clayoquot.....I know how you love my spelling ☺ hee hee

From: Paylor, Adrienne
Sent: September-19-18 4:17 PM
To: McCorquodale, Brenda; Patirana, Anoma
Subject: FYI media call on sea lice today

Just for your awareness we got a call from media today regarding sea lice in the Clayquot area. CRMAQ had to cull a farm this summer (high lice was just one of many reasons why) so this may come up in conversations and I'm not sure if I fully debriefed about this on management calls? Anyway some details below and I'll let you know where it goes tomorrow:

From: Paylor, Adrienne
Sent: September-19-18 4:00 PM
To: Webb, Allison
Subject: No notes from the ROCS call :)

Took the ROCS call and nothing significant to report.

On an internal program note we did get a media inquiry today regarding the Cull at Fortune Channel (in Aug) which they heard was done due to high sea lice numbers. This is a CRMAQ farm in Clayquot Sound so could spark the SLICE resistance and over exceedance issue from this spring. We have responded that the cull was not ordered by DFO nor was it done as a condition of our licence. We will see if that satisfies the inquiry. For your own information we did look into the cull and found it was for multifactorial conditions, not strictly due to lice. In fact they had just conducted a SLICE treatment prior to the culling, with good effect.

Media has been redirected to Cermaq for more details.

s.20(1)(b)

s.21(1)(b)

McCorquodale, Brenda

From: Paylor, Adrienne
Sent: Wednesday, September 19, 2018 2:47 PM
To: McCorquodale, Brenda; Waddington, Zac
Cc: Patirana, Anoma
Subject: RE: Sea Lice Graphs ready for your review

Yes I think we should prepare a management response. We are also getting media inquiries about this today. Zac do you have some bullets from when you briefed Allison? We are making them treat the smolts before restocking etc.

From: McCorquodale, Brenda
Sent: September-19-18 2:37 PM
To: Paylor, Adrienne
Cc: Patirana, Anoma
Subject: RE: Sea Lice Graphs ready for your review

So what is our management response?

What is our explanation of how we have responded to a threshold which is being far exceeded, during the outmigration window? Do we prepare a management response? [REDACTED]

[REDACTED] If it were individual farms it would probably look much more localized and scary than the average numbers.
Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Paylor, Adrienne
Sent: Tuesday, September 18, 2018 4:28 PM
To: Waddington, Zac; Taekema, Bernie John
Cc: McCorquodale, Brenda; Patirana, Anoma
Subject: FW: Sea Lice Graphs ready for your review

We should share these graphs with the IPM group for our call next week.
Adrienne

s.21(1)(a)

s.21(1)(b)

From: Waddington, Zac
Sent: September-18-18 3:38 PM
To: Sandberg, Krista
Subject: RE: Sea Lice Graphs ready for your review

Approved! Though it is shockingly ugly in 2.3....

Zac

From: Sandberg, Krista
Sent: September-18-18 3:04 PM
To: Waddington, Zac
Subject: Sea Lice Graphs ready for your review

Hi Zac,

Another one for you – the zone level sea lice exceedance bar graph is ready for your approval – up to July. Clayoquot is quite shocking...

\\Dcbcvanna01b\VAN_RHQ_4\Aqua\1. PUBLIC REPORTING\9. Sea Lice\2. Exceedance Graphs - Quarterly\SL Zone Level
Graph for WEB.xls

Krista Sandberg

Aquaculture Data Coordinator | Coordonnateur de données sur l'aquaculture
Aquaculture Management Division | Gestion de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada
krista.sandberg@dfo-mpo.gc.ca
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



Government
of Canada

Gouvernement
du Canada

Canada

s.16(2)(c)

McCorquodale, Brenda

From: McCorquodale, Brenda
Sent: Thursday, September 20, 2018 3:39 PM
To: Paylor, Adrienne
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Thanks.
B ☺

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Paylor, Adrienne
Sent: Thursday, September 20, 2018 3:34 PM
To: McCorquodale, Brenda
Cc: Patirana, Anoma; Webb, Allison
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Very good questions Brenda and I think we should discuss at the upcoming managers meeting if we get a chance.

Traditionally all fish health and parasite treatment and husbandry advisements come for our lead veterinarian who is trained & licenced to practice medicine and qualified to provide direction to other certified industry veterinarians. To my understanding this situation in Clayoquot is unprecedented in that we have never used the transfer licence to require a hatchery treatment nor have we ever required the use of this drug. Theoretically the Imvixa treatment should prevent lice colonization up to the beginning of the outmigration window, but this will be our first field trial of it in BC. Cermaq is developing a mechanical removal technology (the hydrolicer) which is slated to arrive in BC in February-March 2019, this should allow lice treatment following the period of Imvixa efficacy, without reliance on SLICE. Allison was briefed by Zac during the deliberations and consultations with industry pertaining to the restocking of these Cermaq sites.

Adrienne

From: McCorquodale, Brenda
Sent: September-20-18 11:21 AM
To: Paylor, Adrienne
Cc: Patirana, Anoma; Webb, Allison
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Just some general thoughts and questions – it may just be that I haven't been engaged in this because it's not my area, but I'm still interested. ☺

If they have already started treating and stocking, and the life of the drug is 6 – 9 mo, what is the confidence that the fish will be lice-resistant during the outmigration period?
I am curious - Did we consider the management options available to us before approving restocking? Do we have a process for reviewing/approving management response approaches like this – does the Manager, the Director, or Andy review and approve - or is this just a decision we let the vets make?
Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Waddington, Zac
Sent: Wednesday, September 19, 2018 4:45 PM
To: Rainer, Michelle; Paylor, Adrienne
Cc: McCorquodale, Brenda; Patirana, Anoma; Webb, Allison
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Those media lines are still correct. Unfortunately there is no update [REDACTED]
[REDACTED] You may be able to ask Claire Doucette for an update, but I haven't heard anything from them for some time.

The only thing to add is that Cermaq has begun to restock some of their sites which were harvested out in the spring. They are restocking those farms which have fallowed longest, first. And all current transfers of fish into Clayoquot have been treated in the hatchery with a drug called Imvixa which prevents lice colonization for 6-9 months, in the same manner (using the same drug) as flea treatments for cats and dogs. Cermaq has a mechanical lice removal tool (hydrolicer) in development in Norway with an expected arrival for February-March of 2019. The coverage provided by the Imvixa will ensure that lice levels are negligible entering the outmigration of 2019, and then the hydrolicer will be available for use as needed to ensure lice levels are managed without necessitating SLICE during the outmigration. In discussions with Cermaq, this plan was deemed appropriate mitigation, and as a result restocking of those sites was allowed.

Please let me know if you need further details. Feel free to repackage any of the above into media lines as you see fit.

Zac

s.21(1)(a)

From: Rainer, Michelle
Sent: September-19-18 3:27 PM
To: Paylor, Adrienne; Waddington, Zac
Subject: ML_AQUA_SeaLiceClayoquot.doc

s.21(1)(b)

Hi Adrienne,
As agreed, I'll refer her to Cermaq, send her the sea lice infographic and ask her to submit any follow-up questions in writing. These are the media lines from earlier this year; can you please update on the actions referenced?

Thanks,
Michelle

No information has been removed or severed from this page

Delaney, Paula

From: Paylor, Adrienne
Sent: September-20-18 3:10 PM
To: Doucette, Claire
Cc: Webb, Allison; Waddington, Zac
Subject: FW: media query, re Cermaq and sea lice

Hi Claire,

Just as a heads up we have had follow up inquiries from the media regarding enforcement actions in Clayoquot Sound. Globeandmail has asked :

- Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

I would like to touch base next week to prepare a formal response on how the department plans to proceed so hopefully we speak to the enforcement question. If I remember correctly this was an issue of resources and priorities more than case file issues? We will need to discuss with Allison as well in order to finalize our program response.

Thx Adrienne

From: Waddington, Zac
Sent: September-20-18 1:47 PM
To: Rainer, Michelle; Jones, Simon; Paylor, Adrienne
Subject: RE: media query, re Cermaq and sea lice

We are not doing any additional monitoring. We did discuss this possibility; however we are very confident in the monitoring taking place by various eNGO's in the area (one of whom I've spoken with), and third party environmental consultants hired by Cermaq. Unfortunately, we know from past experiences where lice levels have been unmanaged that it does correlate to higher lice levels on out migrating smolts. It was decided that our additional monitoring would not contribute significantly to the understanding of the lice situation in Clayoquot.

That said, we did conduct an independent bioassay (test of SLICE resistance in the lice) using lice from a farm affected with SLICE resistance and significant lice burden. That bioassay confirmed resistance, and the lice from that test were sent to a researcher to help support some genetics work that is being done to better understand the genetic basis for resistance.

Hope that helps,

Zac

From: Rainer, Michelle
Sent: September-20-18 1:25 PM
To: Jones, Simon; Waddington, Zac; Paylor, Adrienne
Subject: FW: media query, re Cermaq and sea lice
Importance: High

Hi there,

Looks like she has all the info she needs from Cermaq about reasons for the closure. Can any of you provide a response to her questions about monitoring in the area? Her deadline is this afternoon so hoping for a quick turnaround 😊.

Thanks,
Michelle

From: [REDACTED]
Sent: September-20-18 11:21 AM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

Hi Michelle, thanks for your email.
I did speak to Cermaq this morning.
The infographic is informative.

A follow-up question:

- Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

From: Rainer, Michelle [mailto:Michelle.Rainer@dfo-mpo.gc.ca]
Sent: Wednesday, September 19, 2018 3:49 PM
To: [REDACTED]
Subject: RE: media query, re Cermaq and sea lice

Hi [REDACTED]

I have confirmed that Cermaq's decision isn't as a result of any directive from DFO so the company is the best source of info for the reasoning behind the closure. If you have any questions for us after speaking to them, can you please submit them in writing?

I've attached an infographic we've recently made that explains L. salmonis (the salmon louse) monitoring and regulations. I hope you find this useful as background. It's new and you're the first person outside of DFO who will have seen it, so I would welcome your feedback if there's anything you find confusing!

Regards,
Michelle Rainer
Communications Advisor | Conseillère en communications
Fisheries and Oceans Canada | Pêches et Océans Canada
200 - 401 Burrard Street, Vancouver, B.C. V6C 3S4 | 200 - 401 rue Burrard, Vancouver, C.-B. V6C 3S4
Telephone | Téléphone 604-775-5065

From: [REDACTED]
Sent: September-19-18 2:17 PM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

Thanks.
No release as far as I know.
I learned about it here:
<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>
I spoke to Cermaq briefly today and was told two letters had been sent out on the issue. I requested them but have not yet received them.

s.19(1)

From: Rainer, Michelle [mailto:Michelle.Rainer@dfo-mpo.gc.ca]

Sent: Wednesday, September 19, 2018 2:15 PM

To: [REDACTED]

Subject: RE: media query, re Cermaq and sea lice

Hi [REDACTED]

I will look into it for you. Was there some sort of release about this?

Thanks,

Michelle

From: [REDACTED]

Sent: September-19-18 1:49 PM

To: RHQ - Media.PAC

Subject: media query, re Cermaq and sea lice

Good day.

My name is [REDACTED] reporter with the Globe and Mail.

I'm working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. (I haven't yet talked directly to the company but I have put in a request.)

I'm hoping to speak to someone at DFO about this development and about sea lice concerns in general.

My deadline to speak to someone is 4 pm Pacific time tomorrow – Thursday September 20.

I can be reached via email or at [REDACTED]

Thank you,

[REDACTED]



s.19(1)

Jones, Simon

From: Jones, Simon
Sent: September-20-18 2:58 PM
To: Waddington, Zac
Subject: FW: media query, re Cermaq and sea lice

Follow Up Flag: Follow up
Flag Status: Flagged

See link below ...

From: Rainer, Michelle
Sent: September-19-18 3:21 PM
To: Jones, Simon
Subject: FW: media query, re Cermaq and sea lice

From: [REDACTED]
Sent: September-19-18 2:17 PM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

Thanks.

No release as far as I know.

I learned about it here:

<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>

I spoke to Cermaq briefly today and was told two letters had been sent out on the issue. I requested them but have not yet received them.

From: Rainer, Michelle [<mailto:Michelle.Rainer@dfo-mpo.gc.ca>]
Sent: Wednesday, September 19, 2018 2:15 PM
To: [REDACTED]
Subject: RE: media query, re Cermaq and sea lice

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Michelle

From: [REDACTED]
Sent: September-19-18 1:49 PM
To: RHQ - Media.PAC
Subject: media query, re Cermaq and sea lice

s.19(1)

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I'm working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. (I haven't yet talked directly to the company but I have put in a request.)

I'm hoping to speak to someone at DFO about this development and about sea lice concerns in general.

My deadline to speak to someone is 4 pm Pacific time tomorrow – Thursday September 20.

I can be reached via email or at [REDACTED]

Thank you,



THE
GLOBE
AND
MAIL

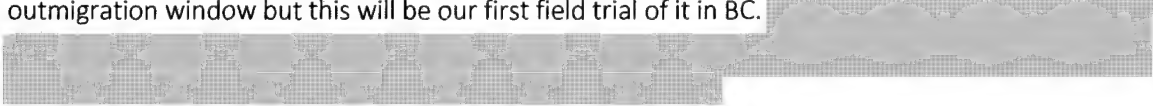


s.19(1)

From: Paylor, Adrienne
To: Waddington, Zac
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc
Date: September-20-18 2:52:08 PM

Please review and correct for me ☺ thx

Very good questions Brenda and I think we should discuss at the upcoming managers meeting if we get a chance. Traditionally all fish health and parasite treatment and husbandry advisements come for our lead veterinarian who is trained & licenced to practice medicine and qualified to provide direction other certified industry veterinarians. To my understanding this situation in Clayoquot is unprecedented in that we have never used the transfer licence to require a hatchery treatment or have we required the use of this drug. Theoretically the Imvixa treatment should get through the outmigration window but this will be our first field trial of it in BC.



From: McCorquodale, Brenda
Sent: September-20-18 11:21 AM
To: Paylor, Adrienne
Cc: Patirana, Anoma; Webb, Allison
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Just some general thoughts and questions – it may just be that I haven't been engaged in this because it's not my area, but I'm still interested. ☺
If they have already started treating and stocking, and the life of the drug is 6 – 9 mo, what is the confidence that the fish will still be lice-resistant during the outmigration period?
I am curious - Did we consider the management options available to us before approving restocking?
Do we have a process for reviewing/approving management response approaches like this – does the Manager, the Director, or Andy review and approve - or is this just a decision we let the vets make?
Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

s.21(1)(a)

s.21(1)(b)

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Waddington, Zac
Sent: Wednesday, September 19, 2018 4:45 PM
To: Rainer, Michelle; Paylor, Adrienne

Cc: McCorquodale, Brenda; Patirana, Anoma; Webb, Allison
Subject: RE: ML_AQUA_SeaLiceClayoquot.doc

Those media lines are still correct. Unfortunately there is no update [REDACTED]
[REDACTED] You may be able to ask Claire Doucette for an update, but I haven't heard anything from them for some time.

The only thing to add is that Cermaq has begun to restock some of their sites which were harvested out in the spring. They are restocking those farms which have fallowed longest, first. And all current transfers of fish into Clayoquot have been treated in the hatchery with a drug called Imvixa which prevents lice colonization for 6-9 months, in the same manner (using the same drug) as flea treatments for cats and dogs. Cermaq has a mechanical lice removal tool (hydrolicer) in development in Norway with an expected arrival for February-March of 2019. The coverage provided by the Imvixa will ensure that lice levels are negligible entering the outmigration of 2019, and then the hydrolicer will be available for use as needed to ensure lice levels are managed without necessitating SLICE during the outmigration. In discussions with Cermaq, this plan was deemed appropriate mitigation, and as a result restocking of those sites was allowed.

Please let me know if you need further details. Feel free to repackage any of the above into media lines as you see fit.

Zac

From: Rainer, Michelle
Sent: September-19-18 3:27 PM
To: Paylor, Adrienne; Waddington, Zac
Subject: ML_AQUA_SeaLiceClayoquot.doc

Hi Adrienne,

As agreed, I'll refer her to Cermaq, send her the sea lice infographic and ask her to submit any follow-up questions in writing. These are the media lines from earlier this year; can you please update on the actions referenced?

Thanks,
Michelle

s.21(1)(a)

s.21(1)(b)

Paylor, Adrienne

From: Paylor, Adrienne
Sent: September-20-18 3:51 PM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

DFO had enough confidence the smolt collection monitoring that was already being conducted by third party groups (NGO's and environmental consultants) that a decision was made to complement this monitoring by collecting sea lice samples to provide additional information on the level of resistance and genetic coding.

From: Rainer, Michelle
Sent: September-20-18 3:36 PM
To: Paylor, Adrienne
Subject: FW: media query, re Cermaq and sea lice

Adrienne, is this OK with you? (I'll clean it up, of course!)

From: Waddington, Zac
Sent: September-20-18 3:26 PM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

See my edits below in red:

- DFO is very confident in the monitoring being done in the Clayoquot area by environmental non-government groups including Cedar Coast Field Station and third party environmental consultants hired by Cermaq. Arrangements have been made for these groups to share their data with DFO [unfortunately we have not made arrangements to have this data shared with us]. For this reason, the Department determined that additional monitoring by the Department would not contribute significantly to the understanding of the sea lice situation in Clayoquot. Instead resources were allocated to performing an independent bioassay (which quantifies and confirms resistance) and supporting ongoing research being conducted to determine the genetic basis for resistance. ~~resources would be better directed at other activities and would not contribute to a better understanding of the sea lice situation in Clayoquot.~~
- In BC, salmon farming companies use an in-feed therapeutant called SLICE to reduce lice abundance. During most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year).
- DFO is keeping a close eye on the issue of SLICE resistance.
- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to Mark Fast, a researcher out of Atlantic Veterinary College who is undertaking work to better understand the genetic basis for SLICE resistance. SLICE resistance is an emerging issue in BC. In recent years, failures of treatment have also been documented at Klemtu in 2015 and Esperanza Inlet in 2017.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm.

- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

From: Rainer, Michelle
Sent: September-20-18 2:52 PM
To: Waddington, Zac; Jones, Simon; Paylor, Adrienne
Subject: RE: media query, re Cermaq and sea lice

Thanks, Zac. I have some lines already approved (by you, I think) on the SLICE bioassay. At least I think this is the same thing.

For response, how about:

- DFO is very confident in the monitoring being done in the Clayoquot area by environmental non-government groups including, ?? ?? [which groups??] and third party environmental consultants hired by Cermaq. Arrangements have been made for these groups to share their data with DFO [can we say that?]. For this reason, the Department determined that resources would be better directed at other activities and would not contribute to a better understanding of the sea lice situation in Clayoquot.
- In BC, salmon farming companies use an in-feed therapeutant called SLICE to reduce lice abundance. During most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year).
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- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. SLICE resistance is an emerging issue in BC. In recent years, failures of treatment have also been documented at Klemtu in 2015 and Esperanza Inlet in 2017.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm.
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

From: Waddington, Zac
Sent: September-20-18 1:47 PM
To: Rainer, Michelle; Jones, Simon; Paylor, Adrienne
Subject: RE: media query, re Cermaq and sea lice

We are not doing any additional monitoring. We did discuss this possibility; however we are very confident in the monitoring taking place by various eNGO's in the area (one of whom I've spoken with), and third party environmental consultants hired by Cermaq. Unfortunately, we know from past experiences where lice levels have been unmanaged that it does correlate to higher lice levels on out migrating smolts. It was decided that our additional monitoring would not contribute significantly to the understanding of the lice situation in Clayoquot.

That said, we did conduct an independent bioassay (test of SLICE resistance in the lice) using lice from a farm affected with SLICE resistance and significant lice burden. That bioassay confirmed resistance, and the lice from that test were sent to a researcher to help support some genetics work that is being done to better understand the genetic basis for resistance.

Hope that helps,

Zac

From: Rainer, Michelle
Sent: September-20-18 1:25 PM
To: Jones, Simon; Waddington, Zac; Paylor, Adrienne
Subject: FW: media query, re Cermaq and sea lice
Importance: High

Hi there,
Looks like she has all the info she needs from Cermaq about reasons for the closure. Can any of you provide a response to her questions about monitoring in the area? Her deadline is this afternoon so hoping for a quick turnaround 😊.
Thanks,
Michelle

From: [REDACTED]
Sent: September-20-18 11:21 AM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

Hi Michelle, thanks for your email.
I did speak to Cermaq this morning.
The infographic is informative.

A follow-up question:

- Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

From: Rainer, Michelle [mailto:Michelle.Rainer@dfo-mpo.gc.ca]
Sent: Wednesday, September 19, 2018 3:49 PM
To: [REDACTED]
Subject: RE: media query, re Cermaq and sea lice

Hi [REDACTED]

I have confirmed that Cermaq's decision isn't as a result of any directive from DFO so the company is the best source of info for the reasoning behind the closure. If you have any questions for us after speaking to them, can you please submit them in writing?

I've attached an infographic we've recently made that explains *L. salmonis* (the salmon louse) monitoring and regulations. I hope you find this useful as background. It's new and you're the first person outside of DFO who will have seen it, so I would welcome your feedback if there's anything you find confusing!

Regards,
Michelle Rainer
Communications Advisor | Conseillère en communications

s.19(1)

Fisheries and Oceans Canada | Pêches et Océans Canada
200 - 401 Burrard Street, Vancouver, B.C. V6C 3S4 | 200 - 401 rue Burrard, Vancouver, C.-B. V6C 3S4
Telephone | Téléphone 604-775-5065

From: [REDACTED]
Sent: September-19-18 2:17 PM
To: Rainer, Michelle
Subject: RE: media query, re Cermaq and sea lice

Thanks.

No release as far as I know.

I learned about it here:

<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>

I spoke to Cermaq briefly today and was told two letters had been sent out on the issue. I requested them but have not yet received them.

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Sent: Wednesday, September 19, 2018 2:15 PM
To: [REDACTED]
Subject: RE: media query, re Cermaq and sea lice

Hi [REDACTED]

I will look into it for you. Was there some sort of release about this?

Thanks,

Michelle

From: [REDACTED]
Sent: September-19-18 1:49 PM
To: RHQ - Media.PAC
Subject: media query, re Cermaq and sea lice

Good day.

My name is [REDACTED] reporter with the Globe and Mail.

I'm working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. (I haven't yet talked directly to the company but I have put in a request.)

I'm hoping to speak to someone at DFO about this development and about sea lice concerns in general.

My deadline to speak to someone is 4 pm Pacific time tomorrow – Thursday September 20.

I can be reached via email or at [REDACTED]

Thank you,

s.19(1)



Rainer, Michelle

From: Rainer, Michelle
Sent: September-21-18 3:47 PM
To: [REDACTED]
Subject: Response from DFO

Hi [REDACTED]

Sorry for the delay; please find response below.

Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutic used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).

DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.

During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.

Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm. DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

Kind regards,

Michelle Rainer

Communications Advisor | Conseillère en communications

Fisheries and Oceans Canada | Pêches et Océans Canada

200 - 401 Burrard Street, Vancouver, B.C. V6C 3S4 | 200 - 401 rue Burrard, Vancouver, C.-B. V6C 3S4

Telephone | Téléphone [604-775-5065](tel:604-775-5065)

s.19(1)

Sandberg, Krista

From: Sandberg, Krista
Sent: September-21-18 3:12 PM
To: McNabb, Melanie
Subject: RE: Sea Lice Graph for Managers

Clayoquot is extremely concerning but I will let Zac speak to that!

Krista Sandberg

Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



Government of Canada
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Canada

From: McNabb, Melanie
Sent: September-21-18 3:04 PM
To: Sandberg, Krista
Subject: RE: Sea Lice Graph for Managers

Thanks so much! Anything we should highlight? Any abnormal #s or worrisome trends?

Melanie McNabb
Governance Coordinator / Coordinatrice de la gouvernance
Fisheries and Oceans Canada, Pacific Region / Pêche et Océans Canada, région du pacifique
200 - 401 rue Burrard St., Vancouver, BC V6C 3S4
Tel. / tél (604) 666-6894
Fax / téléc (604) 666-1076
e-mail / courriel : melanie.mcnabb@dfo-mpo.gc.ca

From: Sandberg, Krista
Sent: September-18-18 3:17 PM
To: McNabb, Melanie
Subject: Sea Lice Graph for Managers

My masterpiece for the day...let me know what you think ☺

\\Dcbovanna01b\VAN_RHQ_4\Aqua\1. PUBLIC REPORTING\9. Sea Lice\Sea Lice Summary for Managers.xls

Krista Sandberg

Aquaculture Data Coordinator | Coordonnateur de données sur l'aquaculture
Aquaculture Management Division | Gestion de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada
krista.sandberg@dfo-mpo.gc.ca
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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s.16(2)(c)

Clayoquot	Threshold		Outmigration		Jul-Feb	
	Feb	Mar	3	6.6	3.5	
	Mar			8.0		
	Apr	3	3	12.8		
	May	3	3	13.1		
	Jun	3				
	Jul				10.1	

Nootka	Feb				1.6	
	Mar	3		2.3		
	Apr	3	3	3.7		
	May	3	3	2.8		
	Jun	3		1.4		
	Jul				12.5	

Janshine Coa	Feb				0.8	
	Mar	3		0.3		
	Apr	3	3	0.2		
	May	3	3	0.1		
	Jun	3		0.1		
	Jul				0.2	

Discovery	Feb				0.1	
	Mar	3		0.1		
	Apr	3	3	0.3		
	May	3	3	0.2		
	Jun	3		0.2		
	Jul				0.4	

Broughton	Feb				0.8	
	Mar	3		0.3		
	Apr	3	3	0.3		
	May	3	3	0.3		
	Jun	3		0.2		
	Jul				0.2	

Port Hardy	Feb				0.2	
	Mar	3		0.3		
	Apr	3	3	0.3		
	May	3	3	0.4		
	Jun	3		0.9		
	Jul				1.7	

Central Coas	Feb				1.3	
	Mar	3		0.9		
	Apr	3	3	0.4		
	May	3	3	1.2		
	Jun	3		0.7		
	Jul				0.3	

Anderson, Shannon

From: [REDACTED]
Sent: September-24-18 11:56 AM
To: [REDACTED]
Subject: REMINDER - Clayoquot Salmon Wed Sept 26
Attachments: Clayoquot Sound Roundtable Aug 15 2018 Draft Minutes.doc

Hello all,

Just a reminder of the Clayoquot Salmon Roundtable this Wednesday, Sept. 26, starting at 10am at the Tin Wis Best Western Resort.

Draft Agenda:

1. Welcome and Introductions
2. Approval of minutes from Aug. 15, 2018
3. Run Reconstruction Project update, and short and long-term approach
4. Wilf Rocks – planning for winter discussion
5. Marine Risk Assessment – initiation of discussion on framework and planning
6. Habitat and Fundraising Subcommittee Report
7. Roundtable work plan for 2018/19
8. Participant updates
9. Next meeting

Thanks and see you then.

[REDACTED]
West Coast Aquatic
Cell [REDACTED]
www.westcoastaquatic.ca
www.roundtables.westcoastaquatic.ca
<https://marineguide.ca>

s.19(1)

**Pages 391 to / à 401
are duplicates of
sont des duplicatas des
pages 351 to / à 361**

Jones, Simon

From: Jones, Simon
Sent: September-26-18 11:45 AM
To: Higgins, Mark; Garver, Kyle
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Attachments: Application of the Precautionary Approach Within a Risk Management Frame...sj.docx

Mark,
Here are my thoughts and comments.
Simon

From: Higgins, Mark
Sent: September-24-18 4:18 PM
To: Garver, Kyle; Jones, Simon
Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

I would like the 2 of you to be part of this review please. Can you provide comments on the attached document and return to me by next Monday? Thanks,

From: Lowe, Carmel
Sent: September-19-18 12:05 PM
To: Higgins, Mark; Holmes, John; Kennedy, Eddy
Cc: MacDougall, Lesley; Houston, Kim; Patten, Bruce
Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

All – see below and attached.

Mark – I would like you engage the others on this email and provide me with a list of the staff that should be included in a review of this draft approach. I propose we then convene a meeting of those staff and those on this email to conduct the review and provide a consolidated response back to Jay and Ingrid. Let me know if there are any issues/concerns with this proposed approach – and if so, what are alternate suggestions completing the review.

I will ask Catherine to find a time for this regional review meeting during first week of October. I am guessing we will require 2 hours.

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177

Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Parsons, Jay

Sent: September 19, 2018 11:48 AM

To: McCallum, Barry <Barry.McCallum@dfo-mpo.gc.ca>; Vézina, Alain <Alain.Vezina@dfo-mpo.gc.ca>; Bliss, Doug <Doug.Bliss@dfo-mpo.gc.ca>; de Lafontaine, Yves <Yves.deLafontaine@dfo-mpo.gc.ca>; Wang, Sen <Sen.Wang@dfo-mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Laverdure, Louise <Louise.Laverdure@dfo-mpo.gc.ca>
Cc: McPherson, Arran <Arran.McPherson@dfo-mpo.gc.ca>; Moore, Wayne <Wayne.Moore@dfo-mpo.gc.ca>; Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Davis, Ben <Ben.Davis@dfo-mpo.gc.ca>; Meade, James <James.Meade@dfo-mpo.gc.ca>; Sullivan, Mike DJ <Mike.Sullivan@dfo-mpo.gc.ca>; Blair, Tammy <Tammy.Blair@dfo-mpo.gc.ca>; Cooper, Lara <Lara.Cooper@dfo-mpo.gc.ca>; Paul, Stacey D <Stacey.Paul@dfo-mpo.gc.ca>; MacKinnon, Anne-Margaret <Anne-Margaret.MacKinnon@dfo-mpo.gc.ca>; Ouellette, Marc <Marc.Ouellette@dfo-mpo.gc.ca>; Pomerleau, Corinne <Corinne.Pomerleau@dfo-mpo.gc.ca>; Mckindsey, Chris <Chris.Mckindsey@dfo-mpo.gc.ca>; Christie, Gavin C <Gavin.Christie@dfo-mpo.gc.ca>; Geiling, Doug <Doug.Geiling@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; White, Andrea <Andrea.White@dfo-mpo.gc.ca>; Pilcher, Scott <Scott.Pilcher@dfo-mpo.gc.ca>

Subject: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

Le français suit

Colleagues,

As mentioned Monday, a draft Aquaculture Risk Management Framework/Application of the Precautionary Approach has recently been developed, in response to the Minister's request that the Department explain how aquaculture is managed and how the precautionary approach is applied. This supports a number of high profile and public expectations, including the Cohen Commission report, the Minister's mandate letter and the Spring 2018 report from the Commissioner for the Environment and Sustainable Development.

It is important to note that this document is very much still a work in progress. For example, the intention is to balance this document nationally by including additional examples in Annex 2 incorporating east coast applications.

Prior to engaging with the Provinces, Territories and Indigenous Peoples, comments and feedback internally is being sought. Aquaculture Management sent out a version Tuesday to their RDs seeking their comments on the applicability of the framework to aquaculture, and changes and/or improvements.

The attached version is the most recent and current version and should be used for the purpose of review. Unfortunately, it is currently only available in English; the translated version will be sent when it becomes available.

Aquaculture Management has requested feedback by **Friday October 12, 2018**. Therefore, the comments from EOS will also need to be submitted by that time as well.

We ask that you broadly engage the DFO Science community within your region (i.e., in addition to aquaculture staff, also fisheries science and habitat science staff, etc.).

Please send your collated comments, corrections and suggestions to Ingrid Burgetz and Jay Parsons, with a cc to Wayne Moore by October 12th. Ingrid and Ed Porter from Aquaculture Management will then integrate all the comments into the next version. As well, we have been asked to convene a departmental technical review meeting of the document with internal (Science and Management) and external experts. We will soon be approaching you for suggested regional

participants (Aquaculture / Fisheries / Habitat Science). This will also be an additional or alternate approach to providing regional input into the document.

Next steps following this include:

- DFO finalization of the document for external consultation, including presentation to the Minister
- DFO Science & Management internal and external technical review (details to be shared shortly)
- Consultations with P/T through the Canadian Council of Fisheries and Aquaculture Ministers
- Industry consultation
- Indigenous consultations
- Public consultation (on DFO website)
- Final posting on DFO's website

Thank you very much to your collaboration and support.

I apologize for the tight timelines, but this file has the express interest of the Minister.

Chers collègues,

Comme mentionné lundi, une ébauche du cadre de gestion des risques liés à l'aquaculture et de l'application de l'approche de précaution a récemment été élaborée en réponse à la demande du ministre voulant que le Ministère explique la façon dont l'aquaculture est gérée et dont l'approche de précaution est appliquée. Cela appuie un certain nombre d'attentes publiques de premier plan, y compris le rapport de la Commission Cohen, la lettre de mandat du ministre ainsi que le rapport publié par la commissaire à l'environnement et au développement durable au printemps 2018.

Il est important de mentionner que ce document est loin d'être définitif. Par exemple, pour que ce document soit équilibré à l'échelle nationale, nous souhaitons inclure à l'annexe 2 d'autres exemples d'application sur la côte est.

Avant de collaborer avec les provinces, les territoires et les peuples autochtones, nous désirons d'abord obtenir des commentaires à l'interne. Mardi, l'équipe de la Gestion de l'aquaculture a envoyé une version du document à ses directeurs régionaux afin d'obtenir leurs commentaires sur l'applicabilité du cadre à l'aquaculture, ainsi que des suggestions de modifications ou d'améliorations, le cas échéant.

Vous trouverez ci-joint la version la plus récente sur laquelle vous devez vous baser pour effectuer votre examen. Malheureusement, elle n'est disponible qu'en anglais pour le moment; vous recevrez la version traduite dès qu'elle sera prête.

L'équipe de la Gestion de l'aquaculture a demandé que les commentaires soient fournis d'ici le vendredi 12 octobre 2018. Les commentaires des Sciences des écosystèmes et des océans doivent donc aussi être soumis d'ici cette date.

Nous vous demandons de mobiliser, en plus de votre personnel d'aquaculture, la communauté scientifique de Pêches et Océans Canada (MPO) de votre région (le personnel scientifique des pêches et de l'habitat, etc.).

Veuillez envoyer vos commentaires, vos corrections et vos suggestions à Ingrid Burgetz et Jay Parsons, avec copie conforme à Wayne Moore, d'ici le 12 octobre. Ingrid et Ed Porter de l'équipe de la Gestion de l'aquaculture intégreront par la suite tous les commentaires reçus dans la prochaine version. De plus, on nous a demandé de convoquer une réunion d'examen technique du document avec des experts internes (scientifiques et gestionnaires) et externes. Nous vous contacterons bientôt pour des participants régionaux (Science de l'aquaculture des pêches ou de l'habitat). Ce sera également une approche supplémentaire ou alternative pour fournir une contribution régionale au document.

Par la suite, les prochaines étapes seront les suivantes :

- Le MPO finalisera le document aux fins de consultation externe et de présentation au ministre.
- Les équipes des sciences et de la direction du MPO effectueront un examen technique interne et externe du document (les détails seront fournis sous peu).
- Des consultations seront menées auprès des provinces et territoires par l'intermédiaire du Conseil canadien des ministres des pêches et de l'aquaculture.
- L'industrie sera consultée.
- Les peuples autochtones seront consultés.
- Le grand public sera consulté (par l'entremise du site Web du MPO).
- La version définitive du document sera affichée sur le site Web du MPO.

Je vous remercie grandement pour votre collaboration et votre soutien.

Je tiens à m'excuser pour les délais serrés, mais ce dossier est d'un grand intérêt pour le ministre.

Jay

On behalf of SRS and EOSS

Jay Parsons, PhD

Director

Aquaculture, Biotechnology and Aquatic Animal Health Sciences Branch
Fisheries and Oceans Canada / Government of Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tel. 613-990-0278

Directeur

Direction des sciences de l'aquaculture, de la biotechnologie et santé des animaux aquatiques
Pêches et Océans Canada / Gouvernement du Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tél. 613-990-0278



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Application of the Precautionary Approach within a Risk Management Framework for Aquaculture

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Introduction

Globally, aquaculture continues to grow faster than other major food production sector, and has been identified by the FAO, as a critical contributor to food, nutrition and employment in the global economy.¹ The Government of Canada recognizes aquaculture's significant benefits to society, including providing full-time jobs in coastal Canada. In Canada, aquaculture is a relatively new industry and is jointly managed by the federal and provincial governments. There is tremendous potential for the Canadian industry to become an even greater player in overall world production. However, societal conflicts over which human activities are acceptable in Canadian waterbodies have created challenges to the growth and sustainability of aquaculture in Canada. This is often expressed as environmental sustainability concerns, ranging from direct environmental impacts to indirect impacts on wild fish health and productivity. A well-defined risk management framework, which embodies a clear understanding of unacceptable harm, taking precautionary steps where relevant and fully engaging the public throughout the entire risk-management process can help to clearly communicate where there are environmental risks, and can address both environmental sustainability issues and public concerns.

Fisheries and Oceans Canada's (DFO) mandate relates to the conservation of fish and fish habitat. This applies equally to fisheries as it does to decisions related to aquaculture. The starting point for any decisions made by DFO regarding human activities around waterbodies in Canada, including aquaculture, is founded on three key pieces of federal legislation: the *Fisheries Act*, the *Oceans Act* and the *Species at Risk Act*. Consequently, in executing the Department's fiduciary duty, the conservation of fish and fish habitat requires the conservation of biodiversity within the ecosystem, and the habitat and productivity of fish species. Given the complexity of detecting or monitoring biodiversity or productivity, proxies are used as practical measures for managing the environment. Therefore, the threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species.

In addition, there are international commitments and best practices that are relevant to the management of activities. The Rio Declaration of the UN Conference on Environment and Development (UNCED) supports the right of sovereign states to pursue responsible economic development opportunities as long as other member states or future generations are not negatively impacted by such developments. The notion of the Precautionary Approach (PA) is geared towards large-scale threats, especially when the consequences are serious or irreversible (e.g., climate change).

Many governments apply the precautionary principle as part of an overall risk management framework to activities that may not potentially result in large-scale or permanent environmental impacts, but may be activities that have societal concern. It is within this context, that DFO applies precaution as required in delivering its regulatory and legislative responsibilities for aquaculture.

¹ FAO - The State of World Fisheries and Aquaculture 2018

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The following risk management framework for aquaculture is consistent with the overarching Sustainable Fisheries Framework. It also builds on the 2008 Aquaculture Policy Framework (APF) and specific policies developed to support DFO's B.C. Aquaculture Regulatory Program (BCARP).

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Moreover, this Framework is not meant to create any new legal obligations to apply precaution. DFO's role in regulating the aquaculture sector is fundamentally linked to and is consistent with the overarching Sustainable Fisheries Framework. (SFF). The SFF provides the foundation for an ecosystem-based and precautionary approach to fisheries management in Canada, and provides the basis for ensuring Canadian fisheries are conducted in a manner which support conservation and sustainable use. Ultimately, through integration with the broader SFF, the residual effects of aquaculture on fish and fish habitat, following all mitigative actions, ensures that these effects can be taken into account in the sustainable management of fisheries.

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DFO'S Approach to Aquaculture Management

Aquaculture Management Objectives

The overarching departmental aquaculture management objective is to create the conditions for a successful and sustainable aquaculture industry across Canada. Within the overall objective, the department's goal for aquaculture is to ensure that fish and their habitats are protected using regulatory mitigation, monitoring and compliance approaches that are efficient, effective and aligned with the potential risk to the environment, and integrated (to the extent possible) with broader fisheries management approaches. Specifically, the **threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species**. Recognizing that aquaculture is managed federally and by provincial and territorial governments, the department's overall assessment of risk will consider risk management and mitigation measures by all regulatory partners.

An Ecosystem and Precautionary Approach

Ecosystem approaches recognize that humans are part of, and have significant influences on, their environments. In aquaculture management under an ecosystem approach—as in fisheries management more broadly—regulatory decisions consider the impact of human activities on fish species, habitats, and the ecosystem of which these species are a part, and take into account broad ecosystem changes related to weather and climate. While it is recognized that all habitats, species, populations and communities play a role in aquatic ecosystems, some are more important from an ecological perspective and some are more resilient than others.²

DFO incorporates a precautionary approach within its ecosystem approach to fisheries management decision-making, supporting the economic use of resources while ensuring that

² *Principles of Ecosystem Based Fisheries Management*: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/ecosys-back-fiche-eng.htm>.

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potential risks to aquatic environments are managed to prevent harm to fish populations and habitat, and to limit other less serious harm to the extent feasible given available technology and costs. Management decisions are more cautious when scientific information is uncertain, unreliable or less complete.³

Implementing an Ecosystem Approach in Aquaculture

An efficiently and effectively applied ecosystem approach for managing aquaculture in Canada includes risk management that considers environmental impacts holistically to enable the evaluation of ecosystem level impacts. This integrated strategy is supported through a risk management framework. The holistic evaluation of impacts is supported by the use of the Pathways of Effects (PoE) model for aquaculture (see next section).

Taken as a whole, this approach is designed to support the consistent regulatory management of related aquaculture activities while identifying location, species or operational-specific factors that may influence the extent of the impact on the environment in a particular situation.

Aquaculture Environmental Risk Management

There are five major elements in the Department's approach to managing the environmental risks that may arise due to aquaculture activities (Figure 1, below).

- (1) Defining the environmental and ecosystem objectives for aquaculture activities in Canada: these objectives are defined within legislation, through intergovernmental and international agreements, and consideration of societal values;
- (2) Issue identification: these can be identified through the results of scientific research, monitoring of environmental changes, and/or through public engagement;
- (3) Risk assessment: the science-based characterization of the likelihood and consequence of an activity and assessment of the overall risk, based on the current state of knowledge, and, the identification of uncertainty;
- (4) Risk management: this includes the assessment of how to address uncertainties through applying precaution measures and options for regulatory measures (mitigation and compliance/effects monitoring), and management decisions on mitigation, monitoring, and licencing; and,
- (5) Monitoring and evaluation of the activity against the identified risks.

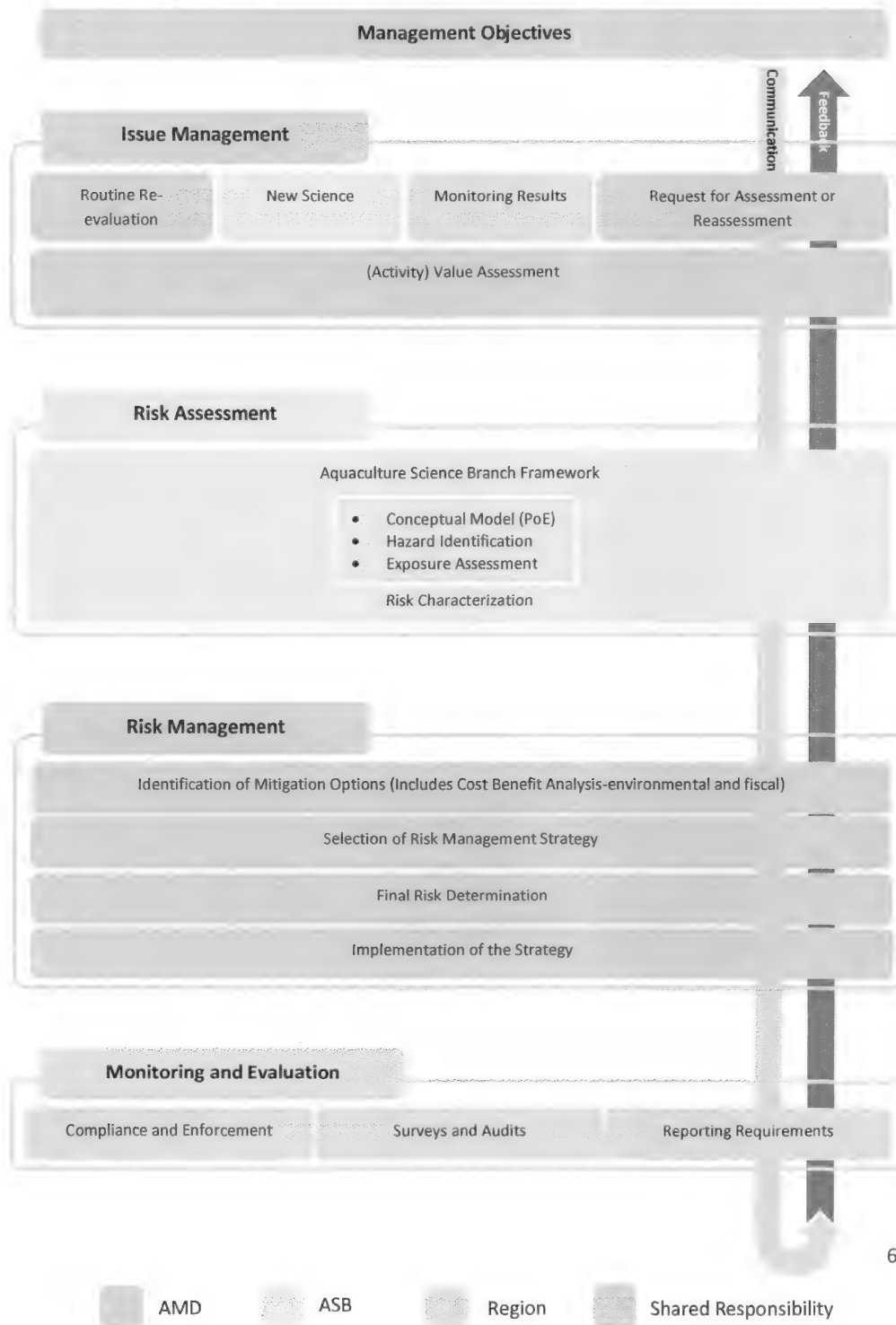
Throughout this process, communication and feedback are critical.

Integral to this process is that management decisions are based on many considerations, including, but not exclusively, scientific, social, economic and political. It is important to note that not all aquatic areas require equal levels of protection, as not all areas are equally ecologically or biologically significant or vulnerable.

³ A Fishery Decision-making Framework Incorporating the Precautionary Approach: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm>.

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Figure 1: Aquaculture Environmental Risk Management Framework



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Management decisions should also take it into consideration, as may be available, Indigenous Peoples traditional and ecological knowledge.

This approach supports management decision-making with respect to both (1) the setting of broad management (mitigation and monitoring) measures, such as siting criteria and general conditions on operations; and, (2) the consideration of individual applications (e.g., new or amended licences), focussing resources on risks that are unique to the proposed application.

Pathways of Effects (PoE) Model

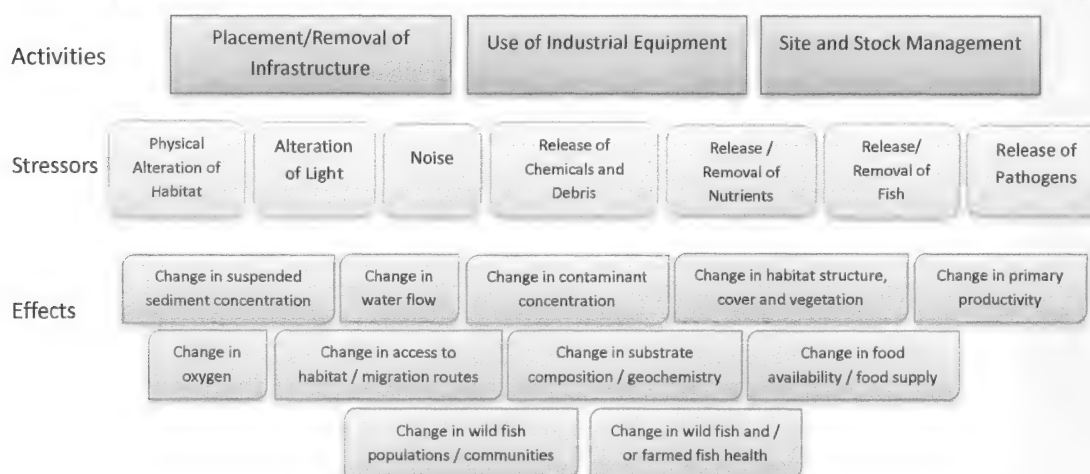
A Pathways of Effects (PoE) model is a tool that can convey complex interactions between human activities, the stress they can place on the environment (pressures), and environmental effects. The model operates on the premise that human activities can place stress on the environment which, in turn, can lead to various environmental effects. The model recognizes that a single environmental stressor can have multiple source activities and can lead to one or more environmental effects. It also recognizes that a single environmental effect can be influenced by one or more stressors or activities.

PoE diagrams group similar components together at each level in the model (activities, stressors and effects), noting inter-linkages in text descriptions of the environmental considerations. These diagrams and descriptions are designed to communicate information in a manner that facilitates the consideration of overall impacts on the environment, and the ecological benefits and costs of various potential management measures, including interactions between measures and cumulative impacts.

The scientific basis for links between aquaculture activities, stressors and effects was peer-reviewed through DFO's Canadian Science Advisory Secretariat process, and the summaries of the scientific state of knowledge for each of the stressors. This information is available for use in the evaluation of aquaculture activities and the identification of where management intervention may be required to protect fish and/or fish productivity/populations.

Figure 2: **Pathways of Effects for Finfish and Shellfish Aquaculture**

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At the specific aquaculture application level, the linkages between each of the stressors and the relevant effects are considered. The specific environment and activity will determine which stressor-effect linkages exist, and what mitigation measures can be used to effectively and sustainably break the stressor-effect linkages.

- **Physical alterations to the habitat** occurs when activities related to placing or removing physical infrastructure (e.g. net pens, longlines, rafts, anchors and moorings, shellfish beach culture structures), as well as during the use of husbandry equipment (e.g. underwater lights to increase growth in marine finfish or acoustic deterrent devices to discourage predators⁴).

The extent and impact of the predicted physical alterations to habitat are considered primarily during the pre-operational stage (e.g. site application), which includes an evaluation of the type of benthic habitat in the area being proposed for aquaculture.

- **Release of chemicals and debris** occurs primarily with activities associated with site and stock management, and the use of operational equipment where chemicals and debris may be released. Examples include the use of pesticides, drugs and antifouling agents, and the use of materials in construction (e.g. steel, wood, floatation) and operations (e.g. feed bags, ropes), which can be lost from sites as debris.

The effect of the use of pesticides, drugs and antifoulants on the receiving environment, including on non-target organisms, is assessed by Health Canada.

- **Release of organic and related matter** occurs as a result of stock management activities (e.g. the feeding and cultivation of fish, removal or natural sloughing of biofouling organisms from physical infrastructure) that have an organic or related component (e.g. nutrients).

The predicted extent of organic deposition on the surrounding seafloor is assessed at the pre-operational stage. As part of the on-going operational compliance, marine finfish aquaculture operations must meet a performance-based regulatory requirement related to the release of organic matter.

- **Removal of nutrients and organic matter** occurs as a result of stock management activities where some cultured species (e.g. bivalves) remove particulate matter, nutrients and oxygen from the water column.

The predicted extent of the removal of nutrients on wild populations is assessed at the pre-operational stage.

- **Release or removal of fish** occurs primarily as a result of stock management activities.

⁴ Note that the use of acoustic deterrent devices is not a current practice in Canadian aquaculture.

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The removal of fish is considered and managed as bycatch. This occurs when some individual wild fish may be temporarily or permanently removed from waters along with cultured fish (e.g. during grading or at harvest), or as part of biofouling or predator control.

The addition of fish to the environment occurs either as a result of intentional stocking of cultured fish into aquatic environments for cultivation (e.g. salmon enhancement), or as a result of unintentional release of fish (e.g. escapes).

The impact on wild populations from the unintentional release of cultured organisms is considered at the pre-operational stage, and is also linked to fiduciary responsibilities associated with the *Species at Risk Act*.

- **Release of pathogens and pests** occurs associated with site and stock management. The increase in biomass of fish within an aquaculture site can influence the presence or abundance of fish pathogens (e.g. bacteria, viruses) and pests (e.g. sea lice and tunicates).

The introduction of pathogens or pests is evaluated at the operational stage, primarily by the Introductions and Transfers Committees (ITC). Conditions of licence outline mitigation measures for the management of the abundance of pathogens or pests.

Additionally, notifiable diseases are regulated by the Canadian Food Inspection Agency.

Additional details on the characterization of each of the stressors, the current status of regulatory thresholds, and current management and mitigation practices are found in Annex 1. Also, a case study for the management of sea lice in B.C. is found in Annex 2.

Stakeholder and Indigenous Peoples' Engagement

Stakeholder and Indigenous peoples' engagement to support sound aquaculture governance is critical. The lack of social licence is a major barrier to robust aquaculture growth. Other factors, including the type of regulatory regime or site-specific development capacity characteristics, may play a role, but not to the extent of societal acceptance. The best mechanism for sustainable growth is via coastal zone and area-based management approaches which fully engage interested stakeholders and indigenous groups, who may actually contribute to decision-making. These processes not only support general agreement of where sites should go, but also the areas of greatest concern to focus on.

It should be recognized that some risks are new or emerging, and the evolution of scientific knowledge may influence society's tolerances and its chosen level of protection. An understanding of the "public's tolerance for risks" or "society's chosen level of protection" underpins the need for high transparency, clear accountability, and meaningful public involvement and communication.

Comment [D1]: There is not a complete lack of social licence. The absence of social licence refers only to a segment of the Canadian population who object to aquaculture. This segment exists mainly in British Columbia

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Two-way sharing of information and the inclusion of a range of perspectives in the decision-making process can become the cornerstone of openness and transparency, and enhance credibility of and trust in the decisions that the Government develops.

Conclusion

DFO has managed aquaculture over the years based on managing environmental impacts and the potential risks these can pose to fish habitat and fish populations, as identified through the DFO peer-reviewed science process. Where relevant, DFO regulators strive to develop management standards or thresholds, which are informed by science, based on best practices globally, and have received some form of stakeholder and indigenous peoples' input.

Aquaculture management is a shared responsibility between the federal and provincial governments; thus, management frameworks need to be foundationally the same. In circumstances where there is a potential for unacceptable harm to fish (population-level effects), it may be appropriate to make decisions and implement precautionary measures in the near term, without having full certainty of the probability or magnitude of harm. Close monitoring would also occur to assess the effectiveness of the measures in addressing risk and overall impacts. Follow-up activities, including research and monitoring, are key to reducing scientific uncertainty and allow improved decisions to be made in the future. Finally, stakeholder and Indigenous peoples' engagement throughout the risk management process is critical, not just at the final decision-making process.

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Annex 1: Details on Aquaculture Stressors, Effects and Risk Management

STRESSOR	THRESHOLD	MANAGEMENT ACTION / MITIGATION
<p>Release of pests and pathogens</p> <p>Pathogens can be endemic in wild fish populations (i.e., occur naturally in wild populations in a region) or exotic (i.e. occur naturally in other locations and have been introduced in a region). The presence of endemic pathogens can be amplified under some circumstances where fish are in close proximity (e.g. spawning grounds, schooling and aquaculture). Endemic pathogens tend to have a less severe effect on native populations than exotic (or introduced, non-endemic) pathogens, as over multiple generations native species have typically developed an immune response to endemic pathogens.</p> <p>The health status of wild fish often cannot be directly assessed, and changes in wild fish populations or communities due to disease are difficult to determine. Diseased and moribund fish are quickly removed from the population through processes such as predation or mortality; sampling can therefore be easily biased toward healthy individuals. The presence or absence of pathogens is particularly difficult to determine in wild fish populations, nor is there available scientific data to determine the effect of low level presence of pathogens at the individual or population level.</p>	<ul style="list-style-type: none"> Sea lice threshold (B.C. only); Mandatory Reporting of Fish Health Events (i.e., treatment or % loss) (B.C. only) 	<p>Conditions of licence require treatment for sea lice above threshold (3 lice/fish in B.C.)</p> <p>Monitoring fish health is a particularly important mitigation tool when cultured fish are destined for movement to another location or for release into aquatic environments. The determination of the appropriateness of planned movements or releases of fish must be based upon a review of the disease and mortality history of the cohort, on recommendations by a qualified fish health professional, on the results of any recommended pre-release disease screening, and on guidance from regulatory agencies.</p>
<p>Release (or removal) of organic matter and nutrients</p> <p>Potential sources of the release of other organic matter include fish carcasses (e.g. from cultured fish or bycatch⁵), feed spillage, faeces,</p>	<ul style="list-style-type: none"> BOD threshold 	<p>Footprint addressed through initial siting decisions (benthic impact depositional modeling)</p> <p>Performance based threshold (on-going assessment once/production cycle) – under the AAR, sites cannot be restocked</p>

⁵ The release of incidental finfish catch during finfish harvest, as may be required under conditions of licence, may contribute to organic matter in the environment if the fish are dead or have a low chance of survival.

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harvest waste or offal, including blood. Release of organic matter into the marine environment from humans working and/or living on site could also constitute a minor contribution of organic matter to aquatic environments, should it occur. Human waste is generated on boats or in working or living accommodations as part of daily activities like cooking, bathing and bodily functions. The majority of organic matter introduced into the environment from finfish aquaculture will be associated with excess feed and faeces. Accumulation of the organic matter can result in a change in the benthic biodiversity around a site.		if sulphide threshold exceeded
Release of chemicals/drugs Pesticides are assessed by the Pest Management Regulatory Agency of Health Canada for value of use, human, animal and environmental risks under the <i>Pest Control Products Act</i> . Factors considered in environmental risk assessments related to pesticides include the potential transport and dispersal of products and/or their constituents following release into waters, as well as the exposure of non-target organisms to concentrations of substances that could result in lethal or sub-lethal (e.g. behavioural, reproductive) effects. The severity of impacts on exposed non-target species will depend on factors such as the toxicity of the product used, the dosage, the presence of susceptible non-target species / life stages of species, and environmental conditions.	<ul style="list-style-type: none"> No thresholds – Research and analysis underway to provide advice on the design of a post-deposit monitoring program. 	<p>PRMA-PMRA can place limits on the timing, location and volume of the release of specific materials.</p> <p>Under development – traffic light system for 1) pre-siting assessment to inform site placement, and 2) cumulative impacts [informed by post deposit monitoring program (site level) and aquaculture monitoring program (bay scale)]</p>
Physical alteration of habitat The addition, removal, and	<ul style="list-style-type: none"> Maximum shellfish aquaculture coverage of 7% per bay in some areas of Canada 	Primarily addressed through initial siting considerations. In situations where wild fish may be

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modification of physical structures may affect bottom sediments, benthic communities, pelagic communities, and hydrodynamics.		present only on a seasonal basis, or where habitat is used by a species during a particular period (e.g. during reproductive phases), measures to limit the duration, timing or extent of installation, harvest or site maintenance activities may be warranted.
<p>Release (or removal) of fish</p> <p>Farmed finfish, including salmon, may escape, usually due to equipment failure or human error. Equipment failure may be weather-related, caused by predator attacks or other events that stress the containment infrastructure. For there to be genetic intrusion, establishment of non-native populations, predation or competition, farmed fish must first be released into the wild through escape or the release of viable gametes.</p>	<ul style="list-style-type: none"> • Reporting of escapes may be required, depending on jurisdiction • No <i>direct</i> genetic impact risk on West Coast from Atlantic salmon farms 	<p>Addressed through conditions of licence and development of national containment standards (to be developed)</p> <p>Regulation of fish containment structures and use of triploid farmed fish would further lower the extent of direct genetic interaction.</p> <p>In the event that an unintentional release does occur, measures such as escape response plans may help to recover released fish., particularly where a significant risk of harmful interaction with wild populations has been identified.</p> <p>Escape reporting and analysis of the measures employed may be used to help assess the effectiveness of current mitigation measures and develop future facility or regulatory measures, as appropriate. Measures for recording and reporting cultured fish inventories as well as accurate records of introductions and transfers of licensed species support a broader understanding of the scope (estimated quantity, species and timing) of unintentional releases, and may form part of the management approach in mitigating their effects.</p> <p>In circumstances where a new species is being considered for rearing in an area for the first time, a specific environmental risk assessment is warranted to determine whether or not an Introductions and Transfers licence should be issued (see National Code on Introductions and Transfers LINK). The Code provides guidance that the I&T risk assessment should typically focus on incremental risk aspects that are particular to that species. Species identified as higher risk may have special regulatory conditions imposed on</p>

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		<p>them to bring the risk to an acceptable level. Where risk outcome warrants, some species may not be authorized for culture. An I&T risk assessment may also be warranted where a species is native to the province but new to culture. In terms of risks related to release of fish, the assessment should start by focussing on the probability of the cultured gametes interacting with wild fish populations, and in the case of finfish, the potential for escaped fish to interact and compete with populations of the same or other species.</p>
<p>Noise</p> <p>Noise associated with aquaculture operations may be produced incidentally during the routine operation of equipment such as aerators, feeders, generators and power washers, and by vessels servicing aquaculture facilities. The effects of such noise are expected to be localized, short-term and likely insufficient to cause injury or permanent displacement to marine organisms.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p>
<p>Alteration in light</p> <p>Measurements of light penetration around net pens show that little visible light is found outside the pens, which suggests that the use of lights in aquaculture will have minimal and mainly local ecological effects.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p> <p><i>In B.C. is there still a requirement to report the use of lights?</i></p>

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Annex 2: A Case Study- Management of the salmon louse ~~Sea Lice~~ in B.C.

1. Description of Stressor and Potential Impact – Sea Lice

Environmental

The release of pathogens or viruses from aquaculture facilities through site and stock management is a stressor described in the Canadian Science Advisory Secretariat (CSAS) research document “Pathways of Effects for Finfish and Shellfish Aquaculture” (PoE). The primary effect associated with this stressor, as described in the PoE, is a change in wild fish and/or farmed fish health. Additional sea lice specific science advice has also been provided, and this case study and analysis draws on this advice⁶.

Sea lice are endemic to the Pacific Coast and are found on several species of Pacific salmon and non-salmonid species. They are also present in other areas of the world where Atlantic salmon reside, such as Norway and Scotland. There are a number of sea lice species throughout the world that have a range of hosts and life cycle characteristics. The species of sea louse that is regulated ~~concern~~ in B.C. ~~from an aquaculture perspective is the~~ *Lepeophtheirus salmonis* (the Salmon salmon louse); however, ~~there is another species, *Caligus clemensi* (the herring louse) which can occasionally~~ occurs ~~cause concern~~ in aquaculture facilities. Regardless of species, ~~the~~ sea lice life cycle includes numerous stages, such as: the free-floating Nauplius stages, infectious copepodid stage, attached chalimus stages, and finally the motile stages (pre-adults, adults).

Farmed Atlantic and Pacific salmon are stocked at the marine sites free of salmon lice and infection occurs by exposure to passing adult wild salmon. This is known as “spillover.” The intensity of infestation on farmed salmon is based on a number of factors including the size of the wild salmon run, sea water temperature, salinity and the health of the farmed fish. Cultured Pacific salmon are less susceptible to salmon ~~ea~~-lice infestation than Atlantic salmon. When infestation occurs at a farm the sea lice numbers may become internally amplified, which may result in “spillback” to wild salmon. Elevation of salmon louse infestation may be harmful to ~~Of particular concern is the effect this may have on juvenile salmon smolts which have recently entered the marine environment and as they are most susceptible to sea lice. Wild salmon smolts out-migrate from their natal streams during the spring and early summer. A corresponding -“out-migration window”, from March 1st to June 30th with more stringent different requirements for management of lice levels, is incorporated into the farm licence conditions. The out migration window as currently defined runs from March 1st until June 30th annually.~~

⁶ Assessment of Sea Lice Monitoring and Non-Chemical Measures, DFO 2014 SAR 2014/006

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Social

There is a high level of concern from a segment of the public, some First Nations and ENGOS, on the impact aquaculture has on wild Pacific salmon, and more specifically on the belief that sea lice can significantly negatively impact wild salmon populations. Wild salmon populations can be highly variable and in some cases a low run in one year can be followed by record high numbers; this happens in areas both with and without aquaculture facilities on migratory routes. Conflicting opinion about the possible impact of high levels of sea lice has not given these groups, governments, the media or the Canadian public a level of comfort that the Department is properly managing the risk the aquaculture industry may pose to wild salmon.

Comment [D2]: An elevated level of comfort may be achieved through more effective communication strategies that high-light what is being done to manage salmon lice. Also years ago, DFO ran an annual sea lice surveillance program on juvenile wild salmon in the Broughton – and posted the monthly results on-line. This kind of information established what are the normal levels of lice on juvenile salmon, what constitutes high levels, and how often high lice levels occur.

2. Current Management and Mitigation – Sea Lice

The goal of the current management approach is to ensure that no disease or disease agent negatively impacts the protection and conservation of fish. Presently, risk related to sea lice is managed through licence conditions and the Fish Health auditing program.

Pre-Operational Management Approach

The Precautionary Approach is applied during the consideration of new sites, both from a site-specific and broader area perspective. This is also true for applications for increased production at an existing site. There is recognition of the potential risk of increased sea lice abundance and corresponding infection of out-migrating salmon from licenced facilities as a result of increased salmon production at the farm or area level. Assessments including the history of sea lice abundance levels at that farm and neighbouring farms in the general area include recommendations for mitigation measures, such as area-based management (e.g. coordinated and timing of stocking, fallowing and sea lice treatments), maintenance of single-year classes, practicing integrated pest management, and timing of stocking to reduce the need for sea lice treatments. Geographic elements considered during the assessment include ~~hydro~~-connectivity between the proposed site and adjacent farms, and proximity to known salmon migration routes.

~~When siting new facilities,~~ Efforts are made to avoid the siting of new aquaculture facilities in areas which are known to be important wild fish migration routes, nurseries, sensitive habitats, or have other importance to wild fish populations or significant to First Nations. Ongoing science and research forms part of this consideration.

Current Operational Management Approach

The licence conditions include sea lice monitoring protocols as well as sea lice abundance thresholds that a licence holder cultivating Atlantic salmon must abide by. The cornerstones of sea lice management in BC are routine monitoring and the application of a management

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threshold. During the outmigration period, sea lice counts are conducted by industry sampling on farms is required at least every two weeks at minimum during the out migration period. During this time, and DFO conducts sea lice audits by sampling auditing of the reported numbers and sampling methodology occurs on 50% of all active farms during this time. For the remainder of the year, sampling by industry is only required once per month. The sea lice management threshold is, but will increase to every two weeks if threshold levels three motile (pre-adult and adult) lice (*Lepeophtheirus salmonis*) per fish are exceeded. This threshold is set at an average of three motile (pre-adult and adult) lice (*Lepeophtheirus salmonis*) per fish. During the outmigration period, During the outmigration window, salmon farmers are required to maintain lice are maintained levels below the three motile lice threshold level, typically by harvesting or treatment. Outside this period, there is no they are not obligation that farmers must maintain levels below the ed to maintain their threshold, but must notify DFO must be notified when the threshold is they exceeded and develop a mitigation strategy must be developed for consideration by DFO officials. This system allows for lice control during the sensitive out-migration period, but does not require treatment outside this period, thereby reducing the use and potential development of resistance to various sea lice therapeutants. Sea lice sampling on farms is required every two weeks at minimum during the out migration period, and DFO auditing of the reported numbers and sampling methodology occurs on 50% of all active farms during this time. For the remainder of the year, sampling by industry is only required once per month, but will increase to every two weeks if threshold levels are exceeded.

Mitigation

Companies are increasingly moving towards an area-based management approach where all smolts in a given area are the same year-class and, if treatments are required, they are coordinated among between these sites. Treatments are ideally timed in coordinated dien with the migration of returning adult wild fish so that all wild fish have left the area before treatment is initiated. This is to avoid reinfection and retreatment which can lead to resistance. Currently the primary sea lice treatment is the use of emamectin benzoate (SLICE), which is an in-feed parasiticide.

Recently in some areas in B.C., SLICE there is evidence that salmon lice have elevated resistance to SLICE has emerged in recent years. Industry is rapidly developing integrated pest management strategies alternative treatment modalities to curtail SLICE resistance, and prevent the development of wide-spread resistance in the sea lice population in B.C. These include involves the rotational use of alternative treatment methods, such as novel in-feed parasiticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. Hydrolicer). An alternate method of reducing absolute sea lice inventory is through harvesting, which typically would occur when fish are near harvest weight. This method is only effective if harvesting is

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done at a rate that reduces a farm's permissible absolute sea lice inventory (as defined in the licence).

3. Scientific Certainty – Sea Lice

A large number of scientific studies have been conducted in recent years which have tried to determine what, if any, harm is posed to wild salmon by sea lice spillback from Atlantic salmon farms. No conclusive evidence has been found to suggest that sea lice originating from farms are causing harm to wild stocks on a wide scale. This has largely been accepted by stakeholders and opponents to the salmon farming industry. This indicates that the three motile threshold is sufficiently conservative to mitigate risk to wild salmon posed by sea lice originating from farms. In the rare instances where farms have not been able to control lice levels during the out-migration period (often as a result of SLICE resistance), lice levels are found to be higher on out-migrating salmon smolts. This indicates that lice management on farms is vitally important to prevent potentially harmful ~~an undue~~ lice burdens on wild smolts.

Comment [D3]: Failure of SLICE treatments has not always been due to resistance.

4. Residual Risk and Application of the Precautionary Approach – Sea Lice

Environmental

A changing climate may makes future lice mitigation more uncertain and challenging. The effects of in years with warmer water temperatures and increased salinity on the management of lice are poorly understood and should be the focus of research. ~~becomes more difficult. This is likely to become more common as time progresses.~~ The limited availability of sea lice treatment options in BC inevitably led to increased evidence of resistance to SLICE, as has been observed in many other jurisdictions around the world. Additionally, the emergence of SLICE resistance on B.C.'s coast has presented a significant challenge to industry for effective lice management. ~~However, the adoption of alternative additional treatment strategies options by industry is very welcome and indicates has demonstrated that lice levels can should be able to still be effectively managed controlled, despite a changing climate and without sole reliance on SLICE. Effective management is vital to ensure that wide spread resistance to lice therapeutants does not occur as it has in other jurisdictions. Ongoing research into the genetic determinants of lice resistance, use of cleaner fish, alternative treatments and alternative cage designs/husbandry methods are all very promising, and should be encouraged and supported to allow proactive management by industry. Under the present management regime, the residual risk once operational is determined to be medium.~~ Application of the Precautionary

Comment [D4]: A formal risk assessment for sea lice should be conducted. To my knowledge, this has not yet been done and this document should make no statement that suggests otherwise.

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Approach requires that the Department utilize existing and potential new management measures to ensure that the risk stays within an acceptable range.

Context	Risk Attributes		
		High	Moderate
	High	-	-
	Moderate	-	X

Social

Based on the level of scientific certainty that sea lice are not causing harm to wild fish populations the level of concern raised by the public is expected to diminish over time. Due to the variable nature of salmon returns there may continue to be a perception that declines in salmon populations are related to sea lice impacts. As noted above, uncertainty environmental residual risk exists based on changing climate conditions. It is incumbent on DFO to ensure a robust scientific program remains in place to better understand how the change in climate conditions is affecting sea lice, and their interaction with farmed and wild fish. If this scientific research along with changing management requirements (as necessary) is communicated to the public in a pro-active manner, social acceptance should increase.

Comment [D5]: Public concern will be diminished through the application of effective communication strategies

Comment [D6]: Effective communication of risks to wild salmon from other human activities (e.g. fisheries) are also required.

Context	Risk Attributes		
		High	Moderate
	High	-	-
	Moderate	-	X

Comment [D7]: This table implies a risk assessment has been undertaken – which to my knowledge is not the case.

5. Next Steps and Future Developments – Sea Lice

DFO conditions of licence relating to lice have been found to be vague, outdated and sometimes unenforceable. Some preliminary ideas on changes to the licence to allow better regulation, while also providing additional tools and guidance to industry, include:

- Consider moving to adult female-based threshold, rather than current motile threshold.

Comment [D8]: Who found this? This statement requires more context and detail.

Comment [D9]: Norway uses an all female threshold. In Norway they are still challenged to manage lice levels. Our motile threshold is more robust because it includes male and female adult and preadult stages

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- Establishment of a farm-based, in addition to a fish-based (as currently used), sea lice threshold (For example, we assume 500 000 fish on farm, with three motiles = 1.5 million lice allowable on a single farm).
- Harvest alone would no longer be deemed an appropriate management action within the out-migration [would only be used to lower farm-based "absolute sea lice inventory" below farm-level threshold (as mentioned above) before entry into out-migration].
- Change licence condition of "active farm" away from number of pens stocked (more than 3), to absolute number of fish on site for a given time (e.g. active site could be defined as: more than 30 days have passed since the introduction of more than 50 000 fish to a sea site).
- Consideration be given to initiating mandatory sea lice reduction prior to March 1, which is the generic time when out-migration is recognized to start, as stated in licence conditions.
- Implement mandatory post in-feed lice treatment reporting to better monitor efficacy.
 - E.g. 25-30 days have passed since the completion of treatment with an in-feed parasiticide medication.
- Implement prohibition on use of lice chemical therapeutant for a time in response to resistance.
 - E.g. treatment failure could be defined as: "failure to achieve > 60% reduction in pre-treatment lice numbers at the 25-30 day post-treatment counts".
- SLICE use would be prohibited at that site again during the calendar year.

Comment [D10]: Existing industry treatment data show most treatments are initiated well before the outmigration window

~~Moving forward~~ The Department must continue to participate in global networks of sea lice researchers, and focus its research efforts on relevant areas including do scientific research on sea lice interactions between and its relationship to farmed and wild salmonids in the context of climate change in order to develop a clearer understanding of the possible linkages between the two and the corresponding risk to cultured and wild fish, and the development of alternative sea lice management strategies. It should also be cognizant of, review related independent science (science which comes from sources outside of DFO), and react to key new findings by adjusting our research objectives. Operationally DFO must adapt to new science, making changes to present management approaches as necessary.

Although the risk posed by sea lice to juvenile wild salmon is considered low based on our present scientific understanding, a Precautionary Approach to the siting of new farms in the future could incorporate the potential of sea lice becoming a higher risk because of changing environmental conditions.

~~Over and above the current~~ operational management approach it is recommended that a risk-based traffic light system be implemented that would be tied to some objective measure of sea

Comment [D11]: There is a need to thoroughly discuss the traffic light (i.e., the Norwegian system) management approach, and whether it, or a modified traffic light approach to sea lice management will work in BC

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lice abundance (e.g. number and severity of exceedances). This approach could amalgamate information from an individual farm or a number in a geographic area that have hydro-connectivity. It is well established that sites which have good overall fish health performance, including a low sea lice burden, are less likely to become susceptible to disease.

Comment [D12]: Alternatively, recognition of clear differences in sea lice risk on farms among management areas in BC indicates the potential value of region-specific management strategies.

A green designation would indicate that historically a site has good sea lice management with rare incidences of threshold exceedance and low or negligible mortality indicating a low residual risk to wild salmon. The Department could consider increases in production at these sites. A yellow designation would indicate some recurrent sea lice threshold exceedances that are able to be managed on site without the risk of associated fish health issues and do not represent a notable threat to wild salmon. Increases in production would not be considered and additional management measures may be required. A red designation would indicate serious, significant or repeated sea lice exceedances that could potentially represent a notable threat to wild salmon. Drastic management measures could include reducing authorized production, a requirement to fallow for a significant time period, or cancellation of the licence.

At present there is a lack of flexibility in the licence conditions to require actions such as those outlined for farms designated red as the Department does not have the legislative authority. Moving forward the Department should pursue legislative/regulatory changes to obtain this authority.

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APPENDIX I: Marine Finfish Pre-Operational Risk Table

There are a number of elements that are already assessed at the pre-operational application stage and the risks are summarized for senior management in a table.

Farm name:	Company:			
Elements Assessed – Wild Fish and Fish Habitat	Low	Med	High	N/A
Presence/use and interactions with CRA fishery or rare species				
Presence of important fish habitat (e.g. sponge reefs, rockfish nursery, etc.)				
Presence/use and interactions with SARA listed species				
Appropriate distance to salmonid-bearing streams				
Appropriate distance to important herring spawn areas				
Appropriate distance to shellfish beds				
Appropriate depth, currents and benthic substrate				
DEPOMOD predictions acceptable				
Existing seabed conditions (e.g. capable of assimilating waste)				
Historic benthic monitoring results				
Use of lights				
Marine mammal usage & mitigation				
Elements Assessed – Fish Health	Low	Med	High	N/A
Diseases of concern on farm, nearby farms, and in area (if known)				
History of appropriate disease management on farm and nearby farms				
Prudent history of medicant use (if known)				
Hydrological connectivity with other farms & co-management plan(s)				
History of compliance and reporting on FH and SL				
Adequacy of submitted FHM, SOPs and Carcass Management Plans				
Water quality (e.g. DO, water flow; if known) & mitigation				
Natural challenges (e.g. plankton issues, harmful algal blooms; if known) & mitigation				
Fish density appropriate to maintain good FH (if known)				
Species intended to be grown is appropriate for the area				
History of predator stress & mitigation (if known)				
Elements Assessed – Sea Lice	Low	Med	High	N/A
Natural occurrence of sea lice at site				
History of staying below sea lice thresholds during smolt out-migration				
Appropriate use of available tools to manage sea lice in future				
Elements Assessed – Existing Fisheries	Low	Med	High	N/A
CSSP closure on bivalve shellfish beds used in CRA fisheries				
First Nations FSC fisheries/site access				
Commercial fisheries (direct or indirect displacement – reduction in stock				
Recreational fisheries (direct or indirect displacement – reduction in stock				
EFA/test fishery/research area				
Geoduck beds				

Dickie, Catherine

From: Lowe, Carmel
Sent: September-26-18 3:13 PM
To: Kaba, Kyle; Thomson, Andrew
Subject: RE: URGENT INFORMAL: Sea Lice

Kyle – we will pull a few science bullets together and share with Andy to add to.....

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Kaba, Kyle
Sent: September 26, 2018 2:18 PM
To: Thomson, Andrew <Andrew.Thomson@dfo-mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>
Subject: FW: URGENT INFORMAL: Sea Lice

Hi Andy/Carmel – We've received an urgent request from MINO on information (that could be shared with the Province) concerning the article linked below. Article is regarding high sea lice counts leading to Cermaq closing farm sites in Clayoquot Sound.

Can you please have a look and provide a few bullets that can be shared with MINO (for sharing with the Province). MINO has requested info as soon as possible. Would it be possible to have something by tomorrow at noon PST? Please let me know.

Thanks in advance and sorry for the short turn around.

Kyle

From: Butcher, Ashley
Sent: September-26-18 1:42 PM
To: Kaba, Kyle
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie
Subject: Re: URGENT INFORMAL: Sea Lice

Hey Kyle - over to you!

From: Richter, Julie
Sent: Wednesday, September 26, 2018 4:32 PM
To: Butcher, Ashley; White, Andrea
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie

Subject: RE: URGENT INFORMAL: Sea Lice

Hi Ashley – Pacific Region would be best placed to respond.
Julie

From: Butcher, Ashley
Sent: September-26-18 4:22 PM
To: White, Andrea; Richter, Julie; Villeneuve, Anne-Marie
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler
Subject: URGENT INFORMAL: Sea Lice

Hey there - not sure who to direct this to. MINO urgently looking for information that could be shared with the province concerning the attached:

<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>

Thanks,

Ashley

Jones, Simon

From: Rainer, Michelle
Sent: September-26-18 3:18 PM
To: Jones, Simon
Subject: Sea lice lines

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Simon,
Hope this helps,
Michelle

Issue: [REDACTED] Globe and Mail ([REDACTED]) She is working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. She has already spoken to Cermaq and has a follow-up question for DFO:
Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

Deadline: Friday, September 21 at 3:00 p.m.

Approved by: Zac Waddington, Adrienne Paylor, Andy Thomson, Bonnie Antcliffe (A/RDG Pacific), shared FYI for awareness with JF LaRue, Philippe Morel, Wayne Moore and Arran McPherson

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutant used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).
- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

s.19(1)

Jones, Simon

From: Hyatt, Kim
Sent: September-26-18 3:40 PM
To: Higgins, Mark; Johnson, Stewart; Sutherland, Terri; Therriault, Thomas; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Attachments: Aquaculture-doc_kdhcomments.docx
Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mark! My comments provided in margins of attached document. Let me know if they require any clarification.

Regards, Kim.

Kim D. Hyatt Ph.D.
Section Head, Regional Ecosystem Effects on Fish and Fisheries
Science Branch, Ecosystem Science Division, Fisheries & Oceans Canada
Pacific Biological Station, Nanaimo, BC V9R 6N7
T: 250 756 7217
F: 250 756 7138
Associate Editor, *Canadian Water Resources Journal*, NRC Research Press

From: Higgins, Mark
Sent: September-26-18 12:36 PM
To: Johnson, Stewart; Sutherland, Terri; Therriault, Thomas; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Hyatt, Kim; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary
Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

Dear all,

Some of you have already been contacted with this request, but I wanted to ensure everyone is on the same page. Please find attached the document on which Ottawa is looking for comment. See below for further details. There may be a call/meeting to discuss any comments received sometime next week, so if you could pass any comments to me by Tuesday, October 2nd, that will give us time to assess how to proceed from there. We are hoping that we can get comments from as many as possible before returning this to Ottawa. If you have any questions, please let me know.

Thanks

Mark Higgins
A/Division Manager ADGT
Fisheries and Oceans Canada / Pêches et Océans Canada
Pacific Biological Station / Station Biologique du Pacifique

Nanaimo, B.C. V9T 6N7

Ph: (250) 756-7072

Cell: [REDACTED]

mark.higgins@dfo-mpo.gc.ca

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From: Lowe, Carmel

Sent: September-19-18 12:05 PM

To: Higgins, Mark; Holmes, John; Kennedy, Eddy

Cc: MacDougall, Lesley; Houston, Kim; Patten, Bruce

Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

All – see below and attached.

Mark – I would like you engage the others on this email and provide me with a list of the staff that should be included in a review of this draft approach. I propose we then convene a meeting of those staff and those on this email to conduct the review and provide a consolidated response back to Jay and Ingrid. Let me know if there are any issues/concerns with this proposed approach – and if so, what are alternate suggestions completing the review.

I will ask Catherine to find a time for this regional review meeting during first week of October. I am guessing we will require 2 hours.

Carmel

Carmel Lowe, Ph.D.

Regional Director Science | Directrice régionale des sciences

Fisheries and Oceans Canada | Pêches et Océans Canada

Pacific Biological Station | Station biologique du Pacifique

3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca

Telephone | Téléphone 250-756-7177

Facsimile | Télécopieur 250-729-8360

Government of Canada | Gouvernement du Canada

From: Parsons, Jay

Sent: September 19, 2018 11:48 AM

To: McCallum, Barry <Barry.McCallum@dfo-mpo.gc.ca>; Vézina, Alain <Alain.Vezina@dfo-mpo.gc.ca>; Bliss, Doug <Doug.Bliss@dfo-mpo.gc.ca>; de Lafontaine, Yves <Yves.deLafontaine@dfo-mpo.gc.ca>; Wang, Sen <Sen.Wang@dfo-

mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Laverdure, Louise <Louise.Laverdure@dfo-mpo.gc.ca>
Cc: McPherson, Arran <Arran.McPherson@dfo-mpo.gc.ca>; Moore, Wayne <Wayne.Moore@dfo-mpo.gc.ca>; Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Davis, Ben <Ben.Davis@dfo-mpo.gc.ca>; Meade, James <James.Meade@dfo-mpo.gc.ca>; Sullivan, Mike DJ <Mike.Sullivan@dfo-mpo.gc.ca>; Blair, Tammy <Tammy.Blair@dfo-mpo.gc.ca>; Cooper, Lara <Lara.Cooper@dfo-mpo.gc.ca>; Paul, Stacey D <Stacey.Paul@dfo-mpo.gc.ca>; MacKinnon, Anne-Margaret <Anne-Margaret.MacKinnon@dfo-mpo.gc.ca>; Ouellette, Marc <Marc.Ouellette@dfo-mpo.gc.ca>; Pomerleau, Corinne <Corinne.Pomerleau@dfo-mpo.gc.ca>; Mckindsey, Chris <Chris.Mckindsey@dfo-mpo.gc.ca>; Christie, Gavin C <Gavin.Christie@dfo-mpo.gc.ca>; Geiling, Doug <Doug.Geiling@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; White, Andrea <Andrea.White@dfo-mpo.gc.ca>; Pilcher, Scott <Scott.Pilcher@dfo-mpo.gc.ca>

Subject: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

Le français suit

Colleagues,

As mentioned Monday, a draft Aquaculture Risk Management Framework/Application of the Precautionary Approach has recently been developed, in response to the Minister's request that the Department explain how aquaculture is managed and how the precautionary approach is applied. This supports a number of high profile and public expectations, including the Cohen Commission report, the Minister's mandate letter and the Spring 2018 report from the Commissioner for the Environment and Sustainable Development.

It is important to note that this document is very much still a work in progress. For example, the intention is to balance this document nationally by including additional examples in Annex 2 incorporating east coast applications.

Prior to engaging with the Provinces, Territories and Indigenous Peoples, comments and feedback internally is being sought. Aquaculture Management sent out a version Tuesday to their RDs seeking their comments on the applicability of the framework to aquaculture, and changes and/or improvements.

The attached version is the most recent and current version and should be used for the purpose of review. Unfortunately, it is currently only available in English; the translated version will be sent when it becomes available.

Aquaculture Management has requested feedback by **Friday October 12, 2018**. Therefore, the comments from EOS will also need to be submitted by that time as well.

We ask that you broadly engage the DFO Science community within your region (i.e., in addition to aquaculture staff, also fisheries science and habitat science staff, etc.).

Please send your collated comments, corrections and suggestions to Ingrid Burgetz and Jay Parsons, with a cc to Wayne Moore by October 12th. Ingrid and Ed Porter from Aquaculture Management will then integrate all the comments into the next version. As well, we have been asked to convene a departmental technical review meeting of the document with internal (Science and Management) and external experts. We will soon be approaching you for suggested regional participants (Aquaculture / Fisheries / Habitat Science). This will also be an additional or alternate approach to providing regional input into the document.

Next steps following this include:

- DFO finalization of the document for external consultation, including presentation to the Minister
- DFO Science & Management internal and external technical review (details to be shared shortly)
- Consultations with P/T through the Canadian Council of Fisheries and Aquaculture Ministers
- Industry consultation

- Indigenous consultations
- Public consultation (on DFO website)
- Final posting on DFO's website

Thank you very much to your collaboration and support.

I apologize for the tight timelines, but this file has the express interest of the Minister.

Chers collègues,

Comme mentionné lundi, une ébauche du cadre de gestion des risques liés à l'aquaculture et de l'application de l'approche de précaution a récemment été élaborée en réponse à la demande du ministre voulant que le Ministère explique la façon dont l'aquaculture est gérée et dont l'approche de précaution est appliquée. Cela appuie un certain nombre d'attentes publiques de premier plan, y compris le rapport de la Commission Cohen, la lettre de mandat du ministre ainsi que le rapport publié par la commissaire à l'environnement et au développement durable au printemps 2018.

Il est important de mentionner que ce document est loin d'être définitif. Par exemple, pour que ce document soit équilibré à l'échelle nationale, nous souhaitons inclure à l'annexe 2 d'autres exemples d'application sur la côte est.

Avant de collaborer avec les provinces, les territoires et les peuples autochtones, nous désirons d'abord obtenir des commentaires à l'interne. Mardi, l'équipe de la Gestion de l'aquaculture a envoyé une version du document à ses directeurs régionaux afin d'obtenir leurs commentaires sur l'applicabilité du cadre à l'aquaculture, ainsi que des suggestions de modifications ou d'améliorations, le cas échéant.

Vous trouverez ci-joint la version la plus récente sur laquelle vous devez vous baser pour effectuer votre examen. Malheureusement, elle n'est disponible qu'en anglais pour le moment; vous recevrez la version traduite dès qu'elle sera prête.

L'équipe de la Gestion de l'aquaculture a demandé que les commentaires soient fournis d'ici le vendredi 12 octobre 2018. Les commentaires des Sciences des écosystèmes et des océans doivent donc aussi être soumis d'ici cette date.

Nous vous demandons de mobiliser, en plus de votre personnel d'aquaculture, la communauté scientifique de Pêches et Océans Canada (MPO) de votre région (le personnel scientifique des pêches et de l'habitat, etc.).

Veuillez envoyer vos commentaires, vos corrections et vos suggestions à Ingrid Burgetz et Jay Parsons, avec copie conforme à Wayne Moore, d'ici le 12 octobre. Ingrid et Ed Porter de l'équipe de la Gestion de l'aquaculture intégreront par la suite tous les commentaires reçus dans la prochaine version. De plus, on nous a demandé de convoquer une réunion d'examen technique du document avec des experts internes (scientifiques et gestionnaires) et externes. Nous vous contacterons bientôt pour des participants régionaux (Science de l'aquaculture des pêches ou de l'habitat). Ce sera également une approche supplémentaire ou alternative pour fournir une contribution régionale au document.

Par la suite, les prochaines étapes seront les suivantes :

- Le MPO finalisera le document aux fins de consultation externe et de présentation au ministre.
- Les équipes des sciences et de la direction du MPO effectueront un examen technique interne et externe du document (les détails seront fournis sous peu).
- Des consultations seront menées auprès des provinces et territoires par l'intermédiaire du Conseil canadien des ministres des pêches et de l'aquaculture.
- L'industrie sera consultée.

- Les peuples autochtones seront consultés.
- Le grand public sera consulté (par l'entremise du site Web du MPO).
- La version définitive du document sera affichée sur le site Web du MPO.

Je vous remercie grandement pour votre collaboration et votre soutien.

Je tiens à m'excuser pour les délais serrés, mais ce dossier est d'un grand intérêt pour le ministre.

Jay

On behalf of SRS and EOSS

Jay Parsons, PhD

Director

Aquaculture, Biotechnology and Aquatic Animal Health Sciences Branch
Fisheries and Oceans Canada / Government of Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tel. 613-990-0278

Directeur

Direction des sciences de l'aquaculture, de la biotechnologie et santé des animaux aquatiques
Pêches et Océans Canada / Gouvernement du Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tél. 613-990-0278



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Application of the Precautionary Approach within a Risk Management Framework for Aquaculture

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Introduction

Globally, aquaculture continues to grow faster than other major food production sectors, and has been identified by the FAO, as a critical contributor to food, nutrition and employment in the global economy.¹ The Government of Canada recognizes aquaculture's significant benefits to society, including providing full-time jobs in coastal Canada. In Canada, aquaculture is a relatively new industry and is jointly managed by the federal and provincial governments. There is tremendous potential for the Canadian industry to become an even greater player in overall world production. However, societal conflicts over which human activities are acceptable in Canadian waterbodies have created challenges to the growth and sustainability of aquaculture in Canada. This is often expressed as environmental sustainability concerns, ranging from direct environmental impacts to indirect impacts on wild fish health and productivity. A well-defined risk management framework, which embodies a clear understanding of unacceptable harm, taking precautionary steps where relevant and fully engaging the public throughout the entire risk-management process can help to clearly communicate where there are environmental risks, and can address both environmental sustainability issues and public concerns.

Fisheries and Oceans Canada's (DFO) mandate relates to the conservation of fish and fish habitat. This applies equally to fisheries as it does to decisions related to aquaculture. The starting point for any decisions made by DFO regarding human activities around waterbodies in Canada, including aquaculture, is founded on three key pieces of federal legislation: the *Fisheries Act*, the *Oceans Act* and the *Species at Risk Act*. Consequently, in executing the Department's fiduciary duty, the conservation of fish and fish habitat requires the conservation of biodiversity within the ecosystem, and the habitat and productivity of fish species. Given the complexity of detecting or monitoring biodiversity or productivity, proxies are used as practical measures for managing the environment. Therefore, the threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species.

In addition, there are international commitments and best practices that are relevant to the management of activities. The Rio Declaration of the UN Conference on Environment and Development (UNCED) supports the right of sovereign states to pursue responsible economic development opportunities as long as other member states or future generations are not negatively impacted by such developments. The notion of the Precautionary Approach (PA) is geared towards large-scale threats, especially when the consequences are serious or irreversible (e.g., climate change).

Many governments apply the precautionary principle as part of an overall risk management framework to activities that may not potentially result in large-scale or permanent environmental impacts, but may be activities that have societal concern. It is within this context, that DFO applies precaution as required in delivering its regulatory and legislative responsibilities for aquaculture.

Comment [D1]: There are also concerns expressed about impacts on the economic value of capture fisheries for wild fish (e.g. sablefish, halibut).

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Comment [D2]: Potential may need to be qualified further. Groups external to DFO often interpret this to be synonymous with possible. If this is how it continues to be framed it is extremely open ended i.e. although it's possible that pigs might fly, it's highly unlikely" which is the type of position we're often attempting to stake out. It would be more readily defensible to talk about activities that are likely versus unlikely to cause a population level effect to fish. This is clearly where the text intends to go in sections below that identify DFO's use of risk assessment and risk management as part of an integrated approach to ensuring capture and culture fisheries, ecosystems, habitats are managed to be sustainable.

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Comment [D3]: Again, the notion of permanent requires further definition. If one defines this in terms of human life-spans, a permanent change is one that lasts longer than the average generation time of our population (e.g. 80 years or less) but from an ecological or evolutionary perspective 80 years is a temporary condition.

¹ FAO - The State of World Fisheries and Aquaculture 2018

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The following risk management framework for aquaculture is consistent with the overarching Sustainable Fisheries Framework. It also builds on the 2008 Aquaculture Policy Framework (APF) and specific policies developed to support DFO's B.C. Aquaculture Regulatory Program (BCARP).

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Moreover, this Framework is not meant to create any new legal obligations to apply precaution. DFO's role in regulating the aquaculture sector is fundamentally linked to and is consistent with the overarching Sustainable Fisheries Framework. (SFF). The SFF provides the foundation for an ecosystem-based and precautionary approach to fisheries management in Canada, and provides the basis for ensuring Canadian fisheries are conducted in a manner which support conservation and sustainable use. Ultimately, through integration with the broader SFF, the residual effects of aquaculture on fish and fish habitat, following all mitigative actions, ensures that these effects can be taken into account in the sustainable management of fisheries.

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DFO'S Approach to Aquaculture Management

Aquaculture Management Objectives

The overarching departmental aquaculture management objective is to create the conditions for a successful and sustainable aquaculture industry across Canada. Within the overall objective, the department's goal for aquaculture is to ensure that fish and their habitats are protected using regulatory mitigation, monitoring and compliance approaches that are efficient, effective and aligned with the potential risk to the environment, and integrated (to the extent possible) with broader fisheries management approaches. Specifically, the **threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species**. Recognizing that aquaculture is managed federally and by provincial and territorial governments, the department's overall assessment of risk will consider risk management and mitigation measures by all regulatory partners.

An Ecosystem and Precautionary Approach

Ecosystem approaches recognize that humans are part of, and have significant influences on, their environments. In aquaculture management under an ecosystem approach—as in fisheries management more broadly—regulatory decisions consider the impact of human activities on fish species, habitats, and the ecosystem of which these species are a part, and take into account broad ecosystem changes related to weather and climate. While it is recognized that all habitats, species, populations and communities play a role in aquatic ecosystems, some are more important from an ecological perspective and some are more resilient than others.²

DFO incorporates a precautionary approach within its ecosystem approach to fisheries management decision-making, supporting the economic use of resources while ensuring that

² *Principles of Ecosystem Based Fisheries Management*: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/ecosys-back-fiche-eng.htm>.

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potential risks to aquatic environments are managed to prevent harm to fish populations and habitat, and to limit other less serious harm to the extent feasible given available technology and costs. Management decisions are more cautious when scientific information is uncertain, unreliable or less complete.³

Implementing an Ecosystem Approach in Aquaculture

An efficiently and effectively applied ecosystem approach for managing aquaculture in Canada includes risk management that considers environmental impacts holistically to enable the evaluation of ecosystem level impacts. This integrated strategy is supported through a risk management framework. The holistic evaluation of impacts is supported by the use of the Pathways of Effects (PoE) model for aquaculture (see next section).

Taken as a whole, this approach is designed to support the consistent regulatory management of related aquaculture activities while identifying location, species or operational-specific factors that may influence the extent of the impact on the environment in a particular situation.

Aquaculture Environmental Risk Management

There are five major elements in the Department's approach to managing the environmental risks that may arise due to aquaculture activities (Figure 1, below).

- (1) Defining the environmental and ecosystem objectives for aquaculture activities in Canada: these objectives are defined within legislation, through intergovernmental and international agreements, and consideration of societal values;
- (2) Issue identification: these can be identified through the results of scientific research, monitoring of environmental changes, and/or through public engagement;
- (3) Risk assessment: the science-based characterization of the likelihood and consequence of an activity and assessment of the overall risk, based on the current state of knowledge, and, the identification of uncertainty;
- (4) Risk management: this includes the assessment of how to address uncertainties through applying precaution measures and options for regulatory measures (mitigation and compliance/effects monitoring), and management decisions on mitigation, monitoring, and licencing; and,
- (5) Monitoring and evaluation of the activity against the identified risks.

Comment [D4]: As noted earlier, it would be advantageous to link items 3 and 4 here explicitly to statements about "potential to induce population level harm" above.

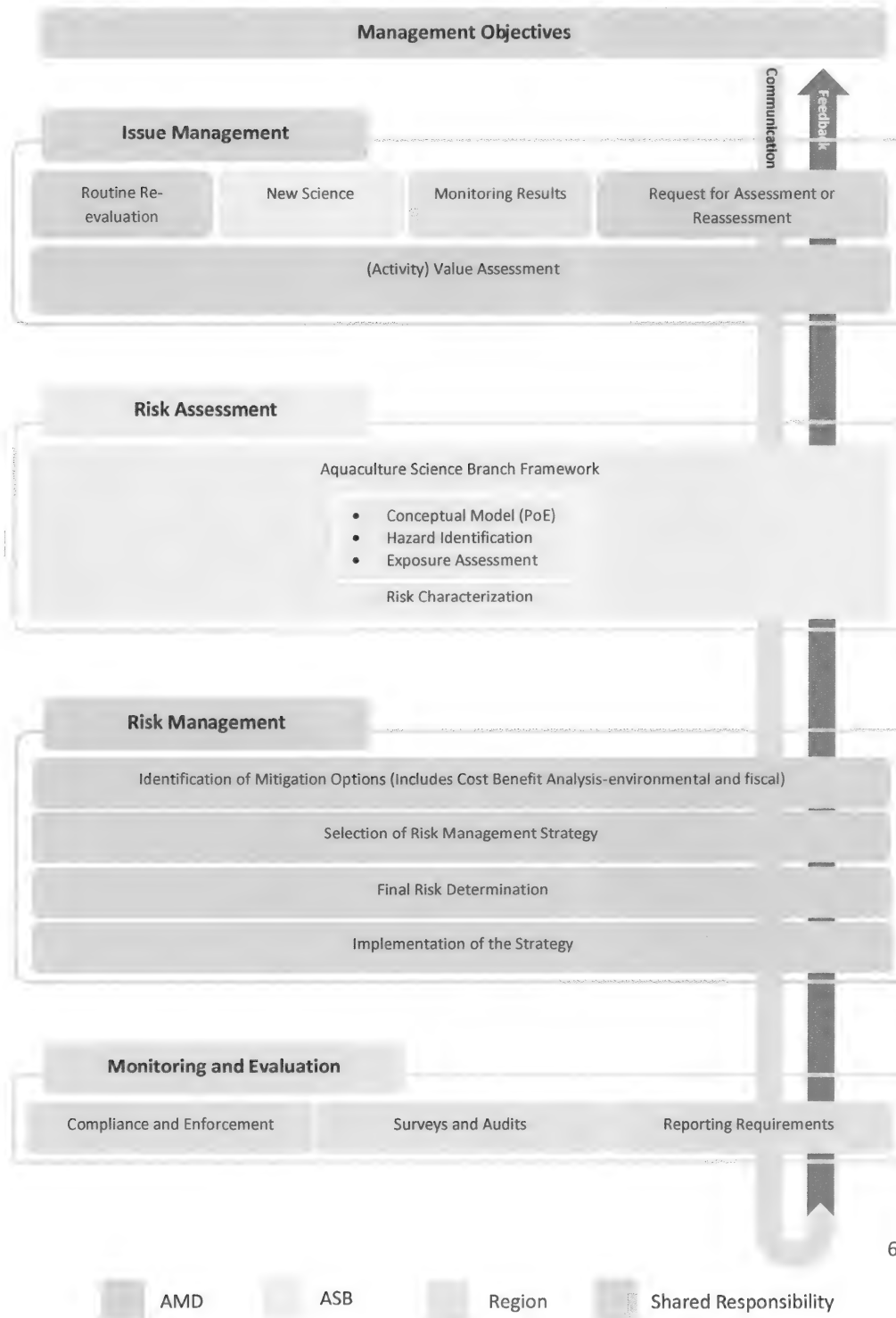
Throughout this process, communication and feedback are critical.

Integral to this process is that management decisions are based on many considerations, including, but not exclusively, scientific, social, economic and political. It is important to note that not all aquatic areas require equal levels of protection, as not all areas are equally ecologically or biologically significant or vulnerable.

³ A Fishery Decision-making Framework Incorporating the Precautionary Approach: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm>.

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Figure 1: Aquaculture Environmental Risk Management Framework



Comment [D5]: Formal risk assessments require assessment of exposure and impacts (outcomes). I don't see this included here unless it's implicit in the PoE element.

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Management decisions should also take it into consideration, as may be available, Indigenous Peoples traditional and ecological knowledge.

This approach supports management decision-making with respect to both (1) the setting of broad management (mitigation and monitoring) measures, such as siting criteria and general conditions on operations; and, (2) the consideration of individual applications (e.g., new or amended licences), focussing resources on risks that are unique to the proposed application.

Pathways of Effects (PoE) Model

A Pathways of Effects (PoE) model is a tool that can convey complex interactions between human activities, the stress they can place on the environment (pressures), and environmental effects. The model operates on the premise that human activities can place stress on the environment which, in turn, can lead to various environmental effects. The model recognizes that a single environmental stressor can have multiple source activities and can lead to one or more environmental effects. It also recognizes that a single environmental effect can be influenced by one or more stressors or activities.

PoE diagrams group similar components together at each level in the model (activities, stressors and effects), noting inter-linkages in text descriptions of the environmental considerations. These diagrams and descriptions are designed to communicate information in a manner that facilitates the consideration of overall impacts on the environment, and the ecological benefits and costs of various potential management measures, including interactions between measures and cumulative impacts.

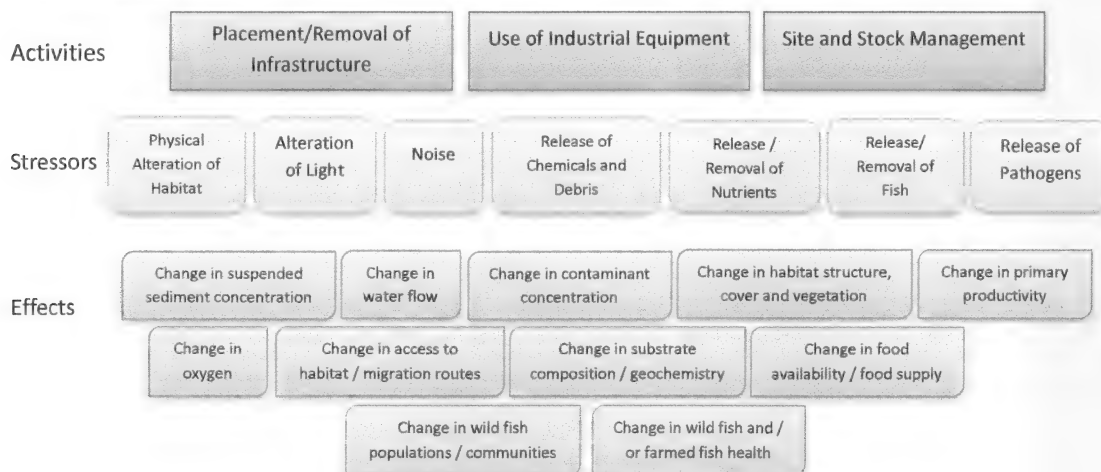
The scientific basis for links between aquaculture activities, stressors and effects was peer-reviewed through DFO's Canadian Science Advisory Secretariat process, and the summaries of the scientific state of knowledge for each of the stressors. This information is available for use in the evaluation of aquaculture activities and the identification of where management intervention may be required to protect fish and/or fish productivity/populations.

Comment [D6]: Weaker language than assessment. Intentional ?

Comment [D7]: Has this been completed ? Are the results published and generally available ? If so, identify the link to reports.

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Figure 2: Pathways of Effects for Finfish and Shellfish Aquaculture



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At the specific aquaculture application level, the linkages between each of the stressors and the relevant effects are considered. The specific environment and activity will determine which stressor-effect linkages exist, and what mitigation measures can be used to effectively and sustainably break the stressor-effect linkages.

- **Physical alterations to the habitat** occurs when activities related to placing or removing physical infrastructure (e.g. net pens, longlines, rafts, anchors and moorings, shellfish beach culture structures), as well as during the use of husbandry equipment (e.g. underwater lights to increase growth in marine finfish or acoustic deterrent devices to discourage predators⁴).

The extent and impact of the predicted physical alterations to habitat are considered primarily during the pre-operational stage (e.g. site application), which includes an evaluation of the type of benthic habitat in the area being proposed for aquaculture.

- **Release of chemicals and debris** occurs primarily with activities associated with site and stock management, and the use of operational equipment where chemicals and debris may be released. Examples include the use of pesticides, drugs and antifouling agents, and the use of materials in construction (e.g. steel, wood, floatation) and operations (e.g. feed bags, ropes), which can be lost from sites as debris.

The effect of the use of pesticides, drugs and antifoulants on the receiving environment, including on non-target organisms, is assessed by Health Canada.

- **Release of organic and related matter** occurs as a result of stock management activities (e.g. the feeding and cultivation of fish, removal or natural sloughing of biofouling organisms from physical infrastructure) that have an organic or related component (e.g. nutrients).

The predicted extent of organic deposition on the surrounding seafloor is assessed at the pre-operational stage. As part of the on-going operational compliance, marine finfish aquaculture operations must meet a performance-based regulatory requirement related to the release of organic matter.

- **Removal/release of nutrients and organic matter** occurs as a result of stock management activities where some cultured species (e.g. bivalves) remove particulate matter, nutrients and oxygen from the water column while others through excretion release nutrients into the water column.

The predicted extent of the removal and/or release of nutrients on food-webs and wild populations is assessed at the pre-operational stage.

- **Release or removal of fish** occurs primarily as a result of stock management activities.

Comment [D8]: Finfish and others will release non-trivial amounts of nitrogenous waste that impact pelagic and benthic food-webs.

Comment [D9]: Is this currently done or should it be added ?

⁴ Note that the use of acoustic deterrent devices is not a current practice in Canadian aquaculture.

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The removal of fish is considered and managed as bycatch. This occurs when some individual wild fish may be temporarily or permanently removed from waters along with cultured fish (e.g. during grading or at harvest), or as part of biofouling or predator control.

The addition of fish to the environment occurs either as a result of intentional stocking of cultured fish into aquatic environments for cultivation (e.g. salmon enhancement), or as a result of unintentional release of fish (e.g. escapes).

The impact on wild populations from the unintentional release of cultured organisms is considered at the pre-operational stage, and is also linked to fiduciary responsibilities associated with the *Species at Risk Act*.

- **Release of pathogens and pests** occurs associated with site and stock management. The increase in biomass of fish within an aquaculture site can influence the presence or abundance of fish pathogens (e.g. bacteria, viruses) and pests (e.g. sea lice and tunicates).

The introduction of pathogens or pests is evaluated at the operational stage, primarily by the Introductions and Transfers Committees (ITC). Conditions of licence outline mitigation measures for the management of the abundance of pathogens or pests. Additionally, notifiable diseases are regulated by the Canadian Food Inspection Agency.

Additional details on the characterization of each of the stressors, the current status of regulatory thresholds, and current management and mitigation practices are found in Annex 1. Also, a case study for the management of sea lice in B.C. is found in Annex 2.

Stakeholder and Indigenous Peoples' Engagement

Stakeholder and Indigenous peoples' engagement to support sound aquaculture governance is critical. The lack of social licence is a major barrier to robust aquaculture growth. Other factors, including the type of regulatory regime or site-specific development capacity characteristics, may play a role, but not to the extent of societal acceptance. The best mechanism for sustainable growth is via coastal zone and area-based management approaches which fully engage interested stakeholders and indigenous groups, who may ~~actually~~ contribute to decision-making. These processes not only support general agreement of where sites should go, but also the areas of greatest concern to focus on.

It should be recognized that some risks are new or emerging, and the evolution of scientific knowledge may influence society's tolerances and its chosen level of protection. An understanding of the "public's tolerance for risks" or "society's chosen level of protection" underpins the need for high transparency, clear accountability, and meaningful public involvement and communication.

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Two-way sharing of information and the inclusion of a range of perspectives in the decision-making process can become the cornerstone of openness and transparency, and enhance credibility of and trust in the decisions that the Government develops.

Conclusion

DFO has managed aquaculture over the years based on managing environmental impacts and the potential risks these can pose to fish habitat and fish populations, as identified through the DFO peer-reviewed science process. Where relevant, DFO regulators strive to develop management standards or thresholds, which are informed by science, based on best practices globally, and have received some form of stakeholder and indigenous peoples' input.

Aquaculture management is a shared responsibility between the federal and provincial governments; thus, management frameworks need to be foundationally the same. In circumstances where there is a potential for unacceptable harm to fish (population-level effects), it may be appropriate to make decisions and implement precautionary measures in the near term, without having full certainty of the probability or magnitude of harm. Close monitoring would also occur to assess the effectiveness of the measures in addressing risk and overall impacts. Follow-up activities, including research and monitoring, are key to reducing scientific uncertainty and allow improved decisions to be made in the future. Finally, stakeholder and Indigenous peoples' engagement throughout the risk management process is critical, not just at the final decision-making process.

Comment [D10]: Do we or should we have anything to say here about the use of results from other peer reviewed science processes from the broader national and international communities of science i.e. are we attempting to be truly inclusive?

Comment [D11]: It's not clear what the jargon "foundationally the same" means, e.g. commonly supported by both?

Comment [D12]: Here too there's a need to be clear i.e. population level effects are possible (?), likely (?), or observed? Sounds like potential but this comes back to the fundamental point of the difference between "any potential" as opposed to applying levels of likelihood defined by risk assessment work in relation to potential. Leaving this open will not promote transparency in communications with those who oppose these types of activities.

Comment [D13]: Research and monitoring have been focused almost entirely on near-field effects while ignoring more subtle and difficult to identify far-field effects. For example, current monitoring to identify near-field versus far-field population level, impacts on wild salmon is largely non-existent. We could do better through standardized monitoring for impacts on a spatial continuum from near to far field locations of specific salmon populations (i.e. parasite and pathogen burdens on smolts out, adults back for a "representative set of populations for which we explicitly assess productivity variations) but have yet to initiate this. Consequently, the evidence we need to defend our approach to aquaculture management to minimize impacts on wild salmon populations remains relatively weak.

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Annex 1: Details on Aquaculture Stressors, Effects and Risk Management

STRESSOR	THRESHOLD	MANAGEMENT ACTION / MITIGATION
<p>Release of pests and pathogens</p> <p>Pathogens can be endemic in wild fish populations (i.e., occur naturally in wild populations in a region) or exotic (i.e. occur naturally in other locations and have been introduced in a region). The presence of endemic pathogens can be amplified under some circumstances where fish are in close proximity (e.g. spawning grounds, schooling and aquaculture). Endemic pathogens tend to have a less severe effect on native populations than exotic (or introduced, non-endemic) pathogens, as over multiple generations native species have typically developed an immune response to endemic pathogens.</p> <p>The health status of wild fish often cannot be directly assessed, and changes in wild fish populations or communities due to disease are difficult to determine. Diseased and moribund fish are quickly removed from the population through processes such as predation or mortality; sampling can therefore be easily biased toward healthy individuals. The presence or absence of pathogens is particularly difficult to determine in wild fish populations, nor is there available scientific data to determine the effect of low level presence of pathogens at the individual or population level.</p>	<ul style="list-style-type: none"> • Sea lice threshold (B.C. only); • Mandatory Reporting of Fish Health Events (i.e., treatment or % loss) (B.C. only) 	<p>Conditions of licence require treatment for sea lice above threshold (3 lice/fish in B.C.)</p> <p>Monitoring fish health is a particularly important mitigation tool when cultured fish are destined for movement to another location or for release into aquatic environments. The determination of the appropriateness of planned movements or releases of fish must be based upon a review of the disease and mortality history of the cohort, on recommendations by a qualified fish health professional, on the results of any recommended pre-release disease screening, and on guidance from regulatory agencies.</p>
<p>Release (or removal) of organic matter and nutrients</p> <p>Potential sources of the release of other organic matter include fish carcasses (e.g. from cultured fish or bycatch⁵), feed spillage, faeces,</p>	<ul style="list-style-type: none"> • BOD threshold 	<p>Footprint addressed through initial siting decisions (benthic impact depositional modeling)</p> <p>Performance based threshold (on-going assessment once/production cycle) – under the AAR, sites cannot be restocked</p>

⁵ The release of incidental finfish catch during finfish harvest, as may be required under conditions of licence, may contribute to organic matter in the environment if the fish are dead or have a low chance of survival.

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<p>harvest waste or offal, including blood. Release of organic matter into the marine environment from humans working and/or living on site could also constitute a minor contribution of organic matter to aquatic environments, should it occur. Human waste is generated on boats or in working or living accommodations as part of daily activities like cooking, bathing and bodily functions. The majority of organic matter introduced into the environment from finfish aquaculture will be associated with excess feed and faeces. Accumulation of the organic matter can result in a change in the benthic biodiversity around a site.</p>		<p>if sulphide threshold exceeded</p>
<p>Release of chemicals/drugs</p> <p>Pesticides are assessed by the Pest Management Regulatory Agency of Health Canada for value of use, human, animal and environmental risks under the <i>Pest Control Products Act</i>. Factors considered in environmental risk assessments related to pesticides include the potential transport and dispersal of products and/or their constituents following release into waters, as well as the exposure of non-target organisms to concentrations of substances that could result in lethal or sub-lethal (e.g. behavioural, reproductive) effects. The severity of impacts on exposed non-target species will depend on factors such as the toxicity of the product used, the dosage, the presence of susceptible non-target species / life stages of species, and environmental conditions.</p>	<ul style="list-style-type: none"> No thresholds – Research and analysis underway to provide advice on the design of a post-deposit monitoring program. 	<p>PRMA can place limits on the timing, location and volume of the release of specific materials.</p> <p>Under development – traffic light system for 1) pre-siting assessment to inform site placement, and 2) cumulative impacts [informed by post deposit monitoring program (site level) and aquaculture monitoring program (bay scale)]</p>
<p>Physical alteration of habitat</p> <p>The addition, removal, and</p>	<ul style="list-style-type: none"> Maximum shellfish aquaculture coverage of 7% per bay in some areas of Canada 	<p>Primarily addressed through initial siting considerations.</p> <p>In situations where wild fish may be</p>

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modification of physical structures may affect bottom sediments, benthic communities, pelagic communities, and hydrodynamics.		present only on a seasonal basis, or where habitat is used by a species during a particular period (e.g. during reproductive phases), measures to limit the duration, timing or extent of installation, harvest or site maintenance activities may be warranted.
<p>Release (or removal) of fish</p> <p>Farmed finfish, including salmon, may escape, usually due to equipment failure or human error. Equipment failure may be weather-related, caused by predator attacks or other events that stress the containment infrastructure. For there to be genetic intrusion, establishment of non-native populations, predation or competition, farmed fish must first be released into the wild through escape or the release of viable gametes.</p>	<ul style="list-style-type: none"> • Reporting of escapes may be required, depending on jurisdiction • No <i>direct</i> genetic impact risk on West Coast from Atlantic salmon farms 	<p>Addressed through conditions of licence and development of national containment standards (to be developed)</p> <p>Regulation of fish containment structures and use of triploid farmed fish would further lower the extent of direct genetic interaction.</p> <p>In the event that an unintentional release does occur, measures such as escape response plans may help to recover released fish., particularly where a significant risk of harmful interaction with wild populations has been identified.</p> <p>Escape reporting and analysis of the measures employed may be used to help assess the effectiveness of current mitigation measures and develop future facility or regulatory measures, as appropriate. Measures for recording and reporting cultured fish inventories as well as accurate records of introductions and transfers of licensed species support a broader understanding of the scope (estimated quantity, species and timing) of unintentional releases, and may form part of the management approach in mitigating their effects.</p> <p>In circumstances where a new species is being considered for rearing in an area for the first time, a specific environmental risk assessment is warranted to determine whether or not an Introductions and Transfers licence should be issued (see National Code on Introductions and Transfers LINK). The Code provides guidance that the I&T risk assessment should typically focus on incremental risk aspects that are particular to that species. Species identified as higher risk may have special regulatory conditions imposed on</p>

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		<p>them to bring the risk to an acceptable level. Where risk outcome warrants, some species may not be authorized for culture. An I&T risk assessment may also be warranted where a species is native to the province but new to culture. In terms of risks related to release of fish, the assessment should start by focussing on the probability of the cultured gametes interacting with wild fish populations, and in the case of finfish, the potential for escaped fish to interact and compete with populations of the same or other species.</p>
<p>Noise</p> <p>Noise associated with aquaculture operations may be produced incidentally during the routine operation of equipment such as aerators, feeders, generators and power washers, and by vessels servicing aquaculture facilities. The effects of such noise are expected to be localized, short-term and likely insufficient to cause injury or permanent displacement to marine organisms.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p>
<p>Alteration in light</p> <p>Measurements of light penetration around net pens show that little visible light is found outside the pens, which suggests that the use of lights in aquaculture will have minimal and mainly local ecological effects.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p> <p><i>In B.C. is there still a requirement to report the use of lights?</i></p>

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Annex 2: A Case Study- Management of Sea Lice in B.C.

1. Description of Stressor and Potential Impact – Sea Lice

Environmental

The release of pathogens or viruses from aquaculture facilities through site and stock management is a stressor described in the Canadian Science Advisory Secretariat (CSAS) research document “Pathways of Effects for Finfish and Shellfish Aquaculture” (PoE). The primary effect associated with this stressor, as described in the PoE, is a change in wild fish and/or farmed fish health. Additional sea lice specific science advice has also been provided, and this case study and analysis draws on this advice⁶.

Sea lice are endemic to the Pacific Coast and are found on several species of Pacific salmon and non-salmonid species. They are also present in other areas of the world where Atlantic salmon reside, such as Norway and Scotland. There are a number of sea lice species throughout the world that have a range of hosts and life cycle characteristics. The species of concern in B.C. from an aquaculture perspective is the *Lepeophtheirus salmonis* (Salmon louse); however, there is another species, *Caligus clemensi* (Herring louse) which can occasionally cause concern in aquaculture facilities. The sea lice life cycle includes numerous stages, such as: the free-floating Nauplius stage, infectious copepodid stage, attached chalimus stages, and finally the motile stages (pre-adults, adults).

Farmed Atlantic and Pacific salmon are stocked at the marine sites free of lice and infection occurs by exposure to passing adult wild salmon. This is known as “spillover.” The intensity of infestation on farmed salmon is based on a number of factors including the size of the wild salmon run, sea water temperature, salinity and the health of the farmed fish. Cultured Pacific salmon are less susceptible to sea lice infestation than Atlantic salmon. When infestation occurs at a farm the sea lice numbers may become internally amplified, which may result in “spillback” to wild salmon. Of particular concern is the effect this may have on juvenile salmon smolts which have recently entered the marine environment as they are most susceptible to sea lice. Wild salmon smolts out-migrate from their natal streams during the spring and early summer. A corresponding “out-migration window” with different requirements for management of lice levels is incorporated into the licence conditions. The out-migration window as currently defined runs from March 1st until June 30th annually.

Social

There is a high level of concern from a segment of the public, some First Nations and ENGOs, on

⁶ Assessment of Sea Lice Monitoring and Non-Chemical Measures, DFO 2014 [SAR 2014/006](#)

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the impact aquaculture has on wild Pacific salmon, and more specifically belief that sea lice can significantly negatively impact wild salmon populations. Wild salmon populations can be highly variable and in some cases a low run in one year can be followed by record high numbers; this happens in areas both with and without aquaculture facilities on migratory routes. Conflicting opinion about the possible impact of high levels of sea lice has not given these groups, governments, the media or the Canadian public a level of comfort that the Department is properly managing the risk the aquaculture industry may pose to wild salmon.

2. Current Management and Mitigation – Sea Lice

The goal of the current management approach is to ensure that no disease or disease agent negatively impacts the protection and conservation of fish. Presently, risk related to sea lice is managed through licence conditions and the Fish Health auditing program.

Pre-Operational Management Approach

The Precautionary Approach is applied during the consideration of new sites, both from a site-specific and broader area perspective. This is also true for applications for increased production at an existing site. There is recognition of the potential risk of increased sea lice abundance and corresponding infection of out-migrating salmon from licenced facilities as a result of increased production. Assessments including the history of sea lice abundance levels at that farm and neighbouring farms in the general area include recommendations for mitigation measures, such as area-based management (e.g. coordinated and timing of stocking, fallowing and sea lice treatments), maintenance of single-year classes, practicing integrated pest management, and timing of stocking to reduce the need for sea lice treatments. Geographic elements considered during the assessment include hydro-connectivity between the proposed site and adjacent farms, and proximity to known salmon migration routes.

When siting new facilities, efforts are made to avoid the siting of new aquaculture facilities in areas which are known to be important wild fish migration routes, nurseries, sensitive habitats, or have other importance to wild fish populations or significant to First Nations. Ongoing science and research forms part of this consideration.

Current Operational Management Approach

The licence conditions include sea lice monitoring protocols as well as sea lice abundance thresholds that a licence holder cultivating Atlantic salmon must abide by. This threshold is set at an average of three motile (pre-adult and adult) lice (*Lepeophtheirus salmonis*) per fish. During the outmigration period, salmon farmers are required to maintain lice levels below the three motile lice threshold. Outside this period, they are not obligated to maintain this threshold, but must notify DFO when they exceed and develop a mitigation strategy for consideration by DFO officials. This system allows for lice control during the sensitive out-

Comment [D14]: This is in part due to the fact that monitoring of wild salmon population variations in near-field and far-field locations along with assessment variations in the seasonal to annual sea-lice reservoir created by aquaculture facilities has not been designed or implemented to yield results that are more precise in pinpointing causes of salmon population level variations than these circumstantial assertions that variations occur due to all sorts of factors.

Comment [D15]: There are virtually no areas along the BC coast where risks to one or more salmon populations of importance to First Nations or others will be low or absent by definition.

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migration period, but does not require treatment outside this period, thereby reducing the use and potential development of resistance to various sea lice therapeutants. Sea lice sampling on farms is required every two weeks at minimum during the out-migration period, and DFO auditing of the reported numbers and sampling methodology occurs on 50% of all active farms during this time. For the remainder of the year, sampling by industry is only required once per month, but will increase to every two weeks if threshold levels are exceeded.

Mitigation

Companies are increasingly moving towards an area-based management approach where all smolts in a given area are the same year-class and, if treatments are required, they are coordinated between these sites. Treatments are ideally timed in coordination with returning adult wild fish so that all wild fish have left the area before treatment is initiated. This is to avoid reinfection and retreatment which can lead to resistance. Currently the primary sea lice treatment is the use of emamectin benzoate (SLICE), which is an in-feed parasiticide.

In some areas in B.C., SLICE resistance has emerged in recent years. Industry is rapidly developing alternative treatment modalities to curtail SLICE resistance, and prevent the development of wide-spread resistance in the sea lice population in B.C. This involves the rotational use of alternative treatment methods, such as novel in-feed parasiticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. Hydrolicer). An alternate method of reducing absolute sea lice inventory is through harvesting, which typically would occur when fish are near harvest weight. This method is only effective if harvesting is done at a rate that reduces a farm's absolute sea lice inventory (as defined in the licence).

3. Scientific Certainty – Sea Lice

A large number of scientific studies have been conducted in recent years which have tried to determine what, if any, harm is posed to wild salmon by sea lice spillback from Atlantic salmon farms. No conclusive evidence has been found to suggest that sea lice originating from farms are causing harm to wild stocks on a wide scale. This has largely been accepted by stakeholders and opponents to the salmon farming industry. This indicates that the three motile threshold is sufficiently conservative to mitigate risk to wild salmon posed by sea lice originating from farms. In the rare instances where farms have not been able to control lice levels during the out-migration period (often as a result of SLICE resistance), lice levels are found to be higher on out-migrating salmon smolts. This indicates that lice management on farms is vitally important to prevent an undue lice burden on wild smolts.

Comment [D16]: Defined on what basis and in which locations ?

Comment [D17]: Same comment as immediately above.

Comment [D18]: This observation if supported with sufficient data would suggest that all parasites/pathogens will generate similar concerns. However if we adhere to the position that population level harm is likely to be associated with frequency of occurrence on either juvenile or adult fish without any demonstration of associated changes in productivity we may be subjecting aquaculture development to greater precaution than necessary. The alternative is to design a standardized monitoring program on wild salmon populations that provide contrast in spatial proximity to aquaculture facilities to determine whether PoE models that suggest risk(s) from parasites and pathogens varies inversely with distance are reliable. The cost of this type of monitoring would likely be less in the moderate to long term than our current practice of dealing with each parasite and pathogen as a special case.

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4. Residual Risk and Application of the Precautionary Approach – Sea Lice

Environmental

A changing climate makes future lice mitigation more uncertain and challenging. In years with warmer water temperatures and increased salinity the management of lice becomes more difficult. This is likely to become more common as time progresses. Additionally, the emergence of SLICE resistance on B.C.'s coast has presented a significant challenge to industry for effective lice management. The adoption of additional treatment options by industry is very welcome and has demonstrated that lice levels should be able to be effectively controlled, despite a changing climate and without sole reliance on SLICE. Effective management is vital to ensure that wide-spread resistance to lice therapeutants does not occur as it has in other jurisdictions. Ongoing research into the genetic determinants of lice resistance, use of cleaner fish, alternative treatments and alternative cage designs/husbandry methods are all very promising, and should be encouraged and supported to allow proactive management by industry. Under the present management regime, the residual risk once operational is determined to be medium. Application of the Precautionary Approach requires that the Department utilize existing and potential new management measures to ensure that the risk stays within an acceptable range.

Comment [D19]: All the more reason to consider the type of monitoring and evaluation of potential spatial and temporal variations in impacts on wild salmon populations noted above.

Context	Risk Attributes		
		High	Moderate
	High		
	Moderate		X

Social

Based on the level of scientific certainty that sea lice are not causing harm to wild fish populations the level of concern raised by the public is expected to diminish over time. Due to the variable nature of salmon returns there may continue to be a perception that declines in salmon populations are related to sea lice impacts. As noted above, environmental residual risk exists based on changing climate conditions. It is incumbent on DFO to ensure a robust scientific program remains in place to better understand how the change in climate conditions is affecting sea lice, and their interaction with farmed and wild fish. If this scientific research along with changing management requirements (as necessary) is communicated to the public in a pro-active manner, social acceptance should increase.

Comment [D20]: Same comment as immediately above.

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	Risk Attributes			
Context		High	Moderate	Low
	High			
	Moderate		X	
	Low			

5. Next Steps and Future Developments – Sea Lice

DFO conditions of licence relating to lice have been found to be vague, outdated and sometimes unenforceable. Some preliminary ideas on changes to the licence to allow better regulation, while also providing additional tools and guidance to industry, include:

- Consider moving to adult female-based threshold, rather than current motile threshold.
- Establishment of a farm-based, in addition to a fish-based (as currently used), sea lice threshold (For example, we assume 500 000 fish on farm, with three motiles = 1.5 million lice allowable on a single farm).
- Harvest would no longer be deemed an appropriate management action within the out-migration [would only be used to lower farm-based “absolute sea lice inventory” below farm-level threshold (as mentioned above) before entry into out-migration].
- Change licence condition of “active farm” away from number of pens stocked (more than 3), to absolute number of fish on site for a given time (e.g. active site could be defined as: more than 30 days have passed since the introduction of more than 50 000 fish to a sea site).
- Consideration be given to initiating mandatory sea lice reduction prior to March 1, which is the generic time when out-migration is recognized to start, as stated in licence conditions.
- Implement mandatory post in-feed lice treatment reporting to better monitor efficacy.
 - E.g. 25-30 days have passed since the completion of treatment with an in-feed parasiticide medication.
- Implement prohibition on use of lice chemical therapeutant for a time in response to resistance.
 - E.g. treatment failure could be defined as: “failure to achieve > 60% reduction in pre-treatment lice numbers at the 25-30 day post-treatment counts”.
- SLICE use would be prohibited at that site again during the calendar year.

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Moving forward the Department must continue to do scientific research on sea lice and its relationship to farmed and wild salmonids in order to develop a clearer understanding of the possible linkages between the two and the corresponding risk to cultured and wild fish. It should also be cognizant of, review related independent science (science which comes from sources outside of DFO), and react to key new findings by adjusting our research objectives. Operationally DFO must adapt to new science, making changes to present management approaches as necessary.

Although the risk posed by sea lice is considered low based on our present scientific understanding, a Precautionary Approach to the siting of new farms in the future could incorporate the potential of sea lice becoming a higher risk because of changing environmental conditions.

Over and above the current operational management approach it is recommended that a risk-based traffic light system be implemented that would be tied to some objective measure of sea lice abundance (e.g. number and severity of exceedances). This approach could amalgamate information from an individual farm or a number in a geographic area that have hydro-connectivity. It is well established that sites which have good overall fish health performance, including a low sea lice burden, are less likely to become susceptible to disease.

A green designation would indicate that historically a site has good sea lice management with rare incidences of threshold exceedance and low or negligible mortality indicating a low residual risk to wild salmon. The Department could consider increases in production at these sites. A yellow designation would indicate some recurrent sea lice threshold exceedances that are able to be managed on site without the risk of associated fish health issues and do not represent a notable threat to wild salmon. Increases in production would not be considered and additional management measures may be required. A red designation would indicate serious, significant or repeated sea lice exceedances that could potentially represent a notable threat to wild salmon. Drastic management measures could include reducing authorized production, a requirement to fallow for a significant time period, or cancellation of the licence.

At present there is a lack of flexibility in the licence conditions to require actions such as those outlined for farms designated red as the Department does not have the legislative authority. Moving forward the Department should pursue legislative/regulatory changes to obtain this authority.

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APPENDIX I: Marine Finfish Pre-Operational Risk Table

There are a number of elements that are already assessed at the pre-operational application stage and the risks are summarized for senior management in a table.

Farm name:	Company:			
Elements Assessed – Wild Fish and Fish Habitat	Low	Med	High	N/A
Presence/use and interactions with CRA fishery or rare species				
Presence of important fish habitat (e.g. sponge reefs, rockfish nursery, etc.)				
Presence/use and interactions with SARA listed species				
Appropriate distance to salmonid-bearing streams				
Appropriate distance to important herring spawn areas				
Appropriate distance to shellfish beds				
Appropriate depth, currents and benthic substrate				
DEPOMOD predictions acceptable				
Existing seabed conditions (e.g. capable of assimilating waste)				
Historic benthic monitoring results				
Use of lights				
Marine mammal usage & mitigation				
Elements Assessed – Fish Health	Low	Med	High	N/A
Diseases of concern on farm, nearby farms, and in area (if known)				
History of appropriate disease management on farm and nearby farms				
Prudent history of medicant use (if known)				
Hydrological connectivity with other farms & co-management plan(s)				
History of compliance and reporting on FH and SL				
Adequacy of submitted FHM, SOPs and Carcass Management Plans				
Water quality (e.g. DO, water flow; if known) & mitigation				
Natural challenges (e.g. plankton issues, harmful algal blooms; if known) & mitigation				
Fish density appropriate to maintain good FH (if known)				
Species intended to be grown is appropriate for the area				
History of predator stress & mitigation (if known)				
Elements Assessed – Sea Lice	Low	Med	High	N/A
Natural occurrence of sea lice at site				
History of staying below sea lice thresholds during smolt out-migration				
Appropriate use of available tools to manage sea lice in future				
Elements Assessed – Existing Fisheries	Low	Med	High	N/A
CSSP closure on bivalve shellfish beds used in CRA fisheries				
First Nations FSC fisheries/site access				
Commercial fisheries (direct or indirect displacement – reduction in stock				
Recreational fisheries (direct or indirect displacement – reduction in stock				
EFA/test fishery/research area				
Geoduck beds				

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No information has been removed or severed from this page

Higgins, Mark

From: Lowe, Carmel
Sent: September-26-18 5:02 PM
To: Jones, Simon
Cc: Higgins, Mark
Subject: RE: URGENT INFORMAL: Sea Lice

Thanks Simon.... Appreciated.

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Jones, Simon
Sent: September 26, 2018 4:17 PM
To: Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>
Cc: Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>
Subject: RE: URGENT INFORMAL: Sea Lice

Carmel, Mark,

I have reorganized the material to bring the more relevant points to the fore:

Related to the Ha-Shilth-Sa article:

- DFO's sea lice regulations focus only on Leps and include a management threshold of 3 lice per fish.
- Prior to closure of the site there was an infestation with another sea lice species, "Caligus".
- The Caligus infestation was sufficiently severe to cause a fish welfare concern and trigger a SLICE treatment.
- Although the SLICE treatment was successful, the farm was closed [REDACTED]
- Persistent, high levels of Caligus are rare on farmed fish; as are welfare concerns caused by this parasite.
- Caligus is a common parasite of herring and stickleback in coastal BC.

Here are DFO's most recent approved media lines relating to sea lice/salmon farming in Clayoquot.

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutant used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).

- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

Please let me know if these require refinement.

Simon

From: Lowe, Carmel
Sent: September-26-18 2:29 PM
To: Higgins, Mark; Jones, Simon
Subject: Fw: URGENT INFORMAL: Sea Lice

See request below.....

Simon - can you develop some bullets to feed into this?

Carmel

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Kaba, Kyle <Kyle.Kaba@dfo-mpo.gc.ca>
Sent: Wednesday, September 26, 2018 14:17
To: Thomson, Andrew; Lowe, Carmel
Subject: FW: URGENT INFORMAL: Sea Lice

Hi Andy/Carmel – We've received an urgent request from MINO on information (that could be shared with the Province) concerning the article linked below. Article is regarding high sea lice counts leading to Cermaq closing farm sites in Clayoquot Sound.

Can you please have a look and provide a few bullets that can be shared with MINO (for sharing with the Province). MINO has requested info as soon as possible. Would it be possible to have something by tomorrow at noon PST? Please let me know.

Thanks in advance and sorry for the short turn around.

Kyle

From: Butcher, Ashley
Sent: September-26-18 1:42 PM

To: Kaba, Kyle

Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie

Subject: Re: URGENT INFORMAL: Sea Lice

Hey Kyle - over to you!

From: Richter, Julie

Sent: Wednesday, September 26, 2018 4:32 PM

To: Butcher, Ashley; White, Andrea

Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie

Subject: RE: URGENT INFORMAL: Sea Lice

Hi Ashley – Pacific Region would be best placed to respond.

Julie

From: Butcher, Ashley

Sent: September-26-18 4:22 PM

To: White, Andrea; Richter, Julie; Villeneuve, Anne-Marie

Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler

Subject: URGENT INFORMAL: Sea Lice

Hey there - not sure who to direct this to. MINO urgently looking for information that could be shared with the province concerning the attached:

<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>

Thanks,

Ashley

Pages 461 to / à 482

are duplicates

sont des duplicatas

Craycroft Stewardship R.T.
10am-

Date 26 Sep 18

TIN WIS.

Review agenda

- Fall programs - hatchery staff in the field; scheduling for future mtgs / topics.

Previous mtg mins - review.

Cermaq clarification / amendment (edits)

TOR

data sharing

local (table share) vs global
minutes are public

presentations / distribution / transparency
State up front abt shareability

Run reconstruction

PSC funded project

intensive sampling June-Sep

nearshore marine

major ops OTOS/DNA.

target 100-200 samples / area

12 WLP rocks; need more

2015 1,000

small component

Samples

↓

2017

5,000

not ready yet.

2018

8,000?

CSRT

Date 26 Sep 18

CWT underestimated — bias —

productivity, exploitation
asked for 2019 funding @ reduced
present data before 2019 IFMP meetings

missing Anousaktarak table
for input L hiring more staff.
- need a more robust study to
confirm best decision re: openings
more data?
What options are available
FBI expressed precautionary approach
1 a day.
more science / discussion

In Spence closer to Clayoquot; more
precautionary. Thought Will Rock
was supported

- wasn't active confirmation

Will test from Cape Cook included?

Will - yes.

DC - lot of rec pressure / 2x trip/day
15 200 CN / 2 weeks enough?

Will - intent; agreed on corridor
charges; review after 3 years

- different approach / lack of info
voluntary measures fell apart.

s.19(1)

Page

CSRT

Date 26 Sep 18

Rec fish compliance (guides/lodges)
lack of adult heads turned in
how to enforce; compliance
voluntary reporting

Wife

Sec 61 Fisheries Act
require to provide catch reports
process; notice, demand; charge
have to do this.

Brad

providing more info; requirement
now; culture shift.

Only 50 samples not 200; concerns
about confidence

technical working group.

- still waiting for CMT to hold in traditional
areas; concern; need action
need agreement for ALL, not just FN.

Tofino Times - culture of sports fishing
lack of trust/science. perspective

- tech cmt; define sampling + triggers
First Nations engagement in grant submissions
- mandatory reporting?

C + P actively enforcing on water?

WL - mid-shore patrol; log book checks
warned, tools, education Request STATS

s.19(1)

Page

CSRT.

Date 26 Sep 18.

working group;

lost 90% of calan

in last

Area 6 concern all survey; decade
ISBM report not AABM; need report
accuracy - Utee Big Bank then inshore
WL activity profile on water

top 40% +/- peak activity (10 am)

flights; consistent timing

lots of interviews; broad base info.

question - is Will Rock fishery

that busy? not "seeing" this

vs Bartlett (outside) Leonard Island

work with guide community

more conservative about cal.

allocations up for review (?)

nature of fishery.

FO C+P audits? GPS.

late announcement late Sept

Area 123; too little, too late 3.5K

WL - data; adjustments; error checking

BB - 15 days to turn data around

spec for Area 6 to provide

opportunity

reporting parity

s.19(1)

GB

table to show monitoring / reporting
mechanisms?

BBB Calan monitoring framework

Page

CSRT

Date

26 Sep 18

Mike; no changes until recovery
review due.

3 yrs up; make changes
stop? move forward

manage risk;
segue Fisheries

broad overview

special information sessions

body of knowledge

→ Fisheries monitoring/impacts

Brad - creel survey videos (STAD) YouTube

- where's sports sector.

problematic access/need dialogue

- Locke; regrets → alternate?

normally no summer meeting

bilateral discussions/vs/ table consensus

Mike Sp

input opportunity; not necessarily

get a decision to please

→ TIME TO REVIEW.

Date - mid Dec/Jan

Need 2017 data
→ mid-dec?

Nov 9 PSC

Alaska
interest run
reconstruction

1st stage

come and gone

2nd stage

shortlisted

C&RT

Date 26 Sep 18.

marine risk assessment.

WL life history model

marine fishery exploitation

limiting factors

estuary health

life stage

principles

cost of change

groceries (marine conditions)

aquaculture

local knowledge; men layer science
biology

weighting factor?
not loudest voice

* show [redacted] database/pivot options
particularly for limiting factors.

expert presenters?

Marc Trudel

global effects on local.

not
say

Salmon Ocean Ecology
(conference).

- Shannon

Lunch

Strategic stock rebuilding plan

early 2020

Framework
gap

workshop this spring

prepared, informed, supported going
into this

"top 5?"

short survey pot risks
priorities

s.19(1)

Page

CSRT

Date 26 Sep 18.

CBT

Survey monkey? series of questions
perception of risk marine "snapshot"
help to identify priorities
elements of risk. — menu
— identification of others

clusters of risk
vulnerability (prepopulate).

- include life stages.
- mechanism. disease, predation

Sub cmte — June develop.
who is lead? Support

content analysis

State of the Ocean WCVI
by Jack workshop Feb —
host in Nanaimo — entire in Jan?
Stephane Kug Organizer

Habitat cmte summary / discussion
collective application Coastal Restoration
Anousahr not there
CWFS taking pen?
alignment C Maa Nueth?
Fundraising; Fish for the Future

CSRT

Date 26 Sep 18

\$560K Carve Creek hatchery - chinook
 Chamber of Commerce
 interpretative centre
 green/environment
 tourism grant
 1.4 M hatchery?
 design - grant separate
 tenure, water licence.

→ START WQhydromet?

Annual workplan.

ask

↳ google docs timing
 scheduling

Habitat assessment summaries
 McWright;

Diana

Treasury Board - wild indicator
 WILF - Kennedy?

check temp data (broad profile).

Chris Neville - trout? & project.

water quality.
 productivity

aquatic invertebrate
 aquaculture
 profiling models

Scientific licence - review lit.

s.19(1)

Page

Date 26 Sep 18

Cermaq

made decision to invest in community partnerships / wild salmon

Shared value, minimize risk / eliminate more focus on solutions.

BC Centre of Aquatic Health

Fortune channel closure - fish welfare

and risk removal / right thing to do

Why? WW conditions / welfare / weakened battle to control sea lice / disease humane euth / compost / too small to harvest. break the cycle.

DFO work / science; supported

Fallow until early 2020; might be late 2019.

northern region - Fallow

Separate one end to the other

Partnership → closest

next cycle incrementally better smaller fish; working on better area based mgmt; improved risk assessment

— broad sea lice issues

FW / salinity / conditions

last winter super dry / high salinity

Caligus not normally a species of concern "herring louse." good herring pps

s.19(1)

Page

CSRT.

Date 26 Sep 18

Cypre →

high sea lice on wild fry.

report →

same test sites by Wild Fish Conservancy
Clayoquot sealice 2007-2007
over to fish + 10 lice.

juvenile herring die off - caligus

can jump off hard to count

life stage difficult to field confirm
"immature".

- coordinate c aquaculture

mainstream Biologic + Ahousaht

Cermaq

relationships; improving communication
new community relations person

Cermaq

escape Sep 14th - new arrival (PM)
10 fish; smolts being delivered to
Site

2015 - 1 fish / rare occurrence

zero tolerance knot tying issue

reported to DFO early next AM

reported to Ahousaht

s.19(1)

hydrolicer fact sheets

Page

CSRT

Date 26 Sep 18

CWFS [REDACTED]

Tranquil - focussed effort side channel
 drive early Sept weather stopped

Hydro Hill year 2 inner mainstem
 stream on highway move materials
 pool-riffle/glide sequence - bridge repair
 additional work

Twin River Chenaka.

had been filled with organics
 now flushed; fish entering.

SIL?

CBT#

RST/bench seining
 report on aggradation. | air photo
 analysis

WIF → Query -
 variation Cnl ad only.
 Bedwell Cnl.

Spanter surveys - Parks Creek.

Cheewah. AZD/21

Wick Road; restoration; resident
 beaver, removed dam.

[REDACTED] Friends of Clayoquot Sound
 looking forward to marine risk Asses

s.19(1)

- CBT

contract data analysis

Washington
 84 Page 11

CSRT

Date 26 Sep 18

Website develop / data
repository

Working on trends / analysis

long term impacts 2015 blob.

Dryoplankton shift / decline
more diatoms /

Royal Roads; Vector

21 Oct Uke

Cashup

20 Oct Tofino

Ocean Science Fair

marine scientists.

Peter Chandler.

Uke Climate change review impacts

— AOM Sunday aft. / Thornton

— in favour of reinstating enhancement levels

Salmon Creek fishway cleaned

CM Swamp by

Area 6 Sept 15 open; Ocean of
Coho; gave up

Kootenai flats - beaver / millions

2001? last habitat assessment.

s.19(1)

Knshi M - DNA

BC Parks -

partnership agreement & CWF5

Clear core Park use permit

Page

CSRT

Date 26 Sep 18.

A24 escapement, #5 low, looking
for peak in next 2 weeks.
- next WCI bulletin on Friday.

Isobel P

DFO contract

strategic plan

risk assessment / habitat assess.
website

need photos of salmon. - local

Early Sept - Haida
pressure on reduction in North
- council mtg in Oct? Coast

Oceans Protection Plan
funding? regional m-tgs
Nov TUFF C NTC FN
PA Campbell R potential?

new funding scheme?

community partnerships
healthy

higher level policy PST/PSC
resident killer whale

PSC CN abundance - 7 Beawell

s.19(1)

Page

CSRT

Date 26 Sep 18

[redacted]
Anousahr

[redacted]
data collection

Fraser St - 26,000 pieces

9,000 CN

multi species fishbones / retention.

8-5-30

calls to make -

27 Sep 18.

[redacted] - CAS
[redacted] - volunteer

[redacted] NWRT

[redacted] WILF LV

[redacted] LFN participation.

[redacted]
afternoon conference call - ENPRO

~~X~~ Torino mass mortality event
- need details from
re pipe break. [redacted]

s.19(1)

Page

Jones, Simon

From: Therriault, Thomas
Sent: September-27-18 1:32 PM
To: Hyatt, Kim; Higgins, Mark; Johnson, Stewart; Sutherland, Terri; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Attachments: Application of the Precautionary Approach_TT.docx
Follow Up Flag: Follow up
Flag Status: Flagged

Mark,
Here are my comments on this document.
Also happy to discuss further if needed.
Cheers,
Tom

From: Hyatt, Kim
Sent: Wednesday, September 26, 2018 3:40 PM
To: Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; Johnson, Stewart <Stewart.Johnson@dfo-mpo.gc.ca>; Sutherland, Terri <Terri.Sutherland@dfo-mpo.gc.ca>; Therriault, Thomas <Thomas.Therriault@dfo-mpo.gc.ca>; O, Miriam <Miriam.O@dfo-mpo.gc.ca>; Coyle, Theraesa <Theraesa.Coyle@dfo-mpo.gc.ca>; Pearce, Chris <Chris.Pearce@dfo-mpo.gc.ca>; King, Jackie <Jackie.King@dfo-mpo.gc.ca>; Robinson, Cliff <Cliff.Robinson@dfo-mpo.gc.ca>; Neville, Chrys <Chrys.Neville@dfo-mpo.gc.ca>; Miller-Saunders, Kristi <Kristi.Saunders@dfo-mpo.gc.ca>; Jones, Simon <Simon.Jones@dfo-mpo.gc.ca>; Garver, Kyle <Kyle.Garver@dfo-mpo.gc.ca>; Chandler, Peter <Peter.Chandler@dfo-mpo.gc.ca>; Bianucci, Laura <Laura.Bianucci@dfo-mpo.gc.ca>; Murray, Cathryn <Cathryn.Murray@dfo-mpo.gc.ca>; Dobson, Diana <Diana.Dobson@dfo-mpo.gc.ca>; MacWilliams, Christine <Christine.MacWilliams@dfo-mpo.gc.ca>
Cc: Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Holmes, John <John.Holmes@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Houston, Kim <Kim.Houston@dfo-mpo.gc.ca>; MacDougall, Lesley <Lesley.MacDougall@dfo-mpo.gc.ca>; Thiess, Mary <Mary.Thiess@dfo-mpo.gc.ca>
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Hi Mark! My comments provided in margins of attached document. Let me know if they require any clarification.

Regards, Kim.

Kim D. Hyatt Ph.D.
Section Head, Regional Ecosystem Effects on Fish and Fisheries
Science Branch, Ecosystem Science Division, Fisheries & Oceans Canada
Pacific Biological Station, Nanaimo, BC V9R 6N7
T: 250 756 7217
F: 250 756 7138
Associate Editor, *Canadian Water Resources Journal*, NRC Research Press

From: Higgins, Mark

Sent: September-26-18 12:36 PM

To: Johnson, Stewart; Sutherland, Terri; Therriault, Thomas; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Hyatt, Kim; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine

Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary

Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

Dear all,

Some of you have already been contacted with this request, but I wanted to ensure everyone is on the same page. Please find attached the document on which Ottawa is looking for comment. See below for further details. There may be a call/meeting to discuss any comments received sometime next week, so if you could pass any comments to me by Tuesday, October 2nd, that will give us time to assess how to proceed from there. We are hoping that we can get comments from as many as possible before returning this to Ottawa. If you have any questions, please let me know.

Thanks

Mark Higgins

A/Division Manager ADGT

Fisheries and Oceans Canada / Pêches et Océans Canada

Pacific Biological Station / Station Biologique du Pacifique

Nanaimo, B.C. V9T 6N7

Ph: (250) 756-7072

Cell: [REDACTED]

mark.higgins@dfo-mpo.gc.ca

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From: Lowe, Carmel

Sent: September-19-18 12:05 PM

To: Higgins, Mark; Holmes, John; Kennedy, Eddy

Cc: MacDougall, Lesley; Houston, Kim; Patten, Bruce

Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

All – see below and attached.

Mark – I would like you engage the others on this email and provide me with a list of the staff that should be included in a review of this draft approach. I propose we then convene a meeting of those staff and those on this email to conduct the review and provide a consolidated response back to Jay and Ingrid. Let me know if there are any issues/concerns with this proposed approach – and if so, what are alternate suggestions completing the review.

I will ask Catherine to find a time for this regional review meeting during first week of October. I am guessing we will require 2 hours.

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Parsons, Jay

Sent: September 19, 2018 11:48 AM

To: McCallum, Barry <Barry.McCallum@dfo-mpo.gc.ca>; Vézina, Alain <Alain.Vezina@dfo-mpo.gc.ca>; Bliss, Doug <Doug.Bliss@dfo-mpo.gc.ca>; de Lafontaine, Yves <Yves.deLafontaine@dfo-mpo.gc.ca>; Wang, Sen <Sen.Wang@dfo-mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Laverdure, Louise <Louise.Laverdure@dfo-mpo.gc.ca>
Cc: McPherson, Arran <Arran.McPherson@dfo-mpo.gc.ca>; Moore, Wayne <Wayne.Moore@dfo-mpo.gc.ca>; Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Davis, Ben <Ben.Davis@dfo-mpo.gc.ca>; Meade, James <James.Meade@dfo-mpo.gc.ca>; Sullivan, Mike DJ <Mike.Sullivan@dfo-mpo.gc.ca>; Blair, Tammy <Tammy.Blair@dfo-mpo.gc.ca>; Cooper, Lara <Lara.Cooper@dfo-mpo.gc.ca>; Paul, Stacey D <Stacey.Paul@dfo-mpo.gc.ca>; MacKinnon, Anne-Margaret <Anne-Margaret.MacKinnon@dfo-mpo.gc.ca>; Ouellette, Marc <Marc.Ouellette@dfo-mpo.gc.ca>; Pomerleau, Corinne <Corinne.Pomerleau@dfo-mpo.gc.ca>; Mckindsey, Chris <Chris.Mckindsey@dfo-mpo.gc.ca>; Christie, Gavin C <Gavin.Christie@dfo-mpo.gc.ca>; Geiling, Doug <Doug.Geiling@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; White, Andrea <Andrea.White@dfo-mpo.gc.ca>; Pilcher, Scott <Scott.Pilcher@dfo-mpo.gc.ca>

Subject: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Importance: High

Le français suit

Colleagues,

As mentioned Monday, a draft Aquaculture Risk Management Framework/Application of the Precautionary Approach has recently been developed, in response to the Minister's request that the Department explain how aquaculture is managed and how the precautionary approach is applied. This supports a number of high profile and public expectations, including the Cohen Commission report, the Minister's mandate letter and the Spring 2018 report from the Commissioner for the Environment and Sustainable Development.

It is important to note that this document is very much still a work in progress. For example, the intention is to balance this document nationally by including additional examples in Annex 2 incorporating east coast applications.

Prior to engaging with the Provinces, Territories and Indigenous Peoples, comments and feedback internally is being sought. Aquaculture Management sent out a version Tuesday to their RDs seeking their comments on the applicability of the framework to aquaculture, and changes and/or improvements.

The attached version is the most recent and current version and should be used for the purpose of review. Unfortunately, it is currently only available in English; the translated version will be sent when it becomes available.

Aquaculture Management has requested feedback by **Friday October 12, 2018**. Therefore, the comments from EOS will also need to be submitted by that time as well.

We ask that you broadly engage the DFO Science community within your region (i.e., in addition to aquaculture staff, also fisheries science and habitat science staff, etc.).

Please send your collated comments, corrections and suggestions to Ingrid Burgetz and Jay Parsons, with a cc to Wayne Moore by October 12th. Ingrid and Ed Porter from Aquaculture Management will then integrate all the comments into the next version. As well, we have been asked to convene a departmental technical review meeting of the document with internal (Science and Management) and external experts. We will soon be approaching you for suggested regional participants (Aquaculture / Fisheries / Habitat Science). This will also be an additional or alternate approach to providing regional input into the document.

Next steps following this include:

- DFO finalization of the document for external consultation, including presentation to the Minister
- DFO Science & Management internal and external technical review (details to be shared shortly)
- Consultations with P/T through the Canadian Council of Fisheries and Aquaculture Ministers
- Industry consultation
- Indigenous consultations
- Public consultation (on DFO website)
- Final posting on DFO's website

Thank you very much to your collaboration and support.

I apologize for the tight timelines, but this file has the express interest of the Minister.

Chers collègues,

Comme mentionné lundi, une ébauche du cadre de gestion des risques liés à l'aquaculture et de l'application de l'approche de précaution a récemment été élaborée en réponse à la demande du ministre voulant que le Ministère explique la façon dont l'aquaculture est gérée et dont l'approche de précaution est appliquée. Cela appuie un certain nombre d'attentes publiques de premier plan, y compris le rapport de la Commission Cohen, la lettre de mandat du ministre ainsi que le rapport publié par la commissaire à l'environnement et au développement durable au printemps 2018.

Il est important de mentionner que ce document est loin d'être définitif. Par exemple, pour que ce document soit équilibré à l'échelle nationale, nous souhaitons inclure à l'annexe 2 d'autres exemples d'application sur la côte est.

Avant de collaborer avec les provinces, les territoires et les peuples autochtones, nous désirons d'abord obtenir des commentaires à l'interne. Mardi, l'équipe de la Gestion de l'aquaculture a envoyé une version du document à ses directeurs régionaux afin d'obtenir leurs commentaires sur l'applicabilité du cadre à l'aquaculture, ainsi que des suggestions de modifications ou d'améliorations, le cas échéant.

Vous trouverez ci-joint la version la plus récente sur laquelle vous devez vous baser pour effectuer votre examen. Malheureusement, elle n'est disponible qu'en anglais pour le moment; vous recevrez la version traduite dès qu'elle sera prête.

L'équipe de la Gestion de l'aquaculture a demandé que les commentaires soient fournis d'ici le vendredi 12 octobre 2018. Les commentaires des Sciences des écosystèmes et des océans doivent donc aussi être soumis d'ici cette date.

Nous vous demandons de mobiliser, en plus de votre personnel d'aquaculture, la communauté scientifique de Pêches et Océans Canada (MPO) de votre région (le personnel scientifique des pêches et de l'habitat, etc.).

Veuillez envoyer vos commentaires, vos corrections et vos suggestions à Ingrid Burgetz et Jay Parsons, avec copie conforme à Wayne Moore, d'ici le 12 octobre. Ingrid et Ed Porter de l'équipe de la Gestion de l'aquaculture intégreront par la suite tous les commentaires reçus dans la prochaine version. De plus, on nous a demandé de convoquer une réunion d'examen technique du document avec des experts internes (scientifiques et gestionnaires) et externes. Nous vous contacterons bientôt pour des participants régionaux (Science de l'aquaculture des pêches ou de l'habitat). Ce sera également une approche supplémentaire ou alternative pour fournir une contribution régionale au document.

Par la suite, les prochaines étapes seront les suivantes :

- Le MPO finalisera le document aux fins de consultation externe et de présentation au ministre.
- Les équipes des sciences et de la direction du MPO effectueront un examen technique interne et externe du document (les détails seront fournis sous peu).
- Des consultations seront menées auprès des provinces et territoires par l'intermédiaire du Conseil canadien des ministres des pêches et de l'aquaculture.
- L'industrie sera consultée.
- Les peuples autochtones seront consultés.
- Le grand public sera consulté (par l'entremise du site Web du MPO).
- La version définitive du document sera affichée sur le site Web du MPO.

Je vous remercie grandement pour votre collaboration et votre soutien.

Je tiens à m'excuser pour les délais serrés, mais ce dossier est d'un grand intérêt pour le ministre.

Jay

On behalf of SRS and EOSS

Jay Parsons, PhD

Director

Aquaculture, Biotechnology and Aquatic Animal Health Sciences Branch
Fisheries and Oceans Canada / Government of Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tel. 613-990-0278

Directeur

Direction des sciences de l'aquaculture, de la biotechnologie et santé des animaux aquatiques
Pêches et Océans Canada / Gouvernement du Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tél. 613-990-0278



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SEPTEMBER 18, 2018 DRAFT

Application of the Precautionary Approach within a Risk Management Framework for Aquaculture

Comment [TT1]: Overall it is unclear who the intended audience is for this. It seems too detailed for a strategic document but too few details are provided to make it a document that would stand alone for practitioners to use.

SEPTEMBER 18, 2018 DRAFT

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SEPTEMBER 18, 2018 DRAFT

Introduction

Globally, aquaculture continues to grow faster than other major food production sectors, and has been identified by the FAO, as a critical contributor to food, nutrition and employment in the global economy.¹ The Government of Canada recognizes aquaculture's significant benefits to society, including providing full-time jobs in coastal Canada. In Canada, aquaculture is a relatively new industry and is jointly managed by the federal and provincial governments. There is tremendous potential for the Canadian industry to become an even greater player in overall world production. However, societal conflicts over which human activities are acceptable in Canadian waterbodies have created challenges to the growth and sustainability of aquaculture in Canada. This is often expressed as environmental sustainability concerns, ranging from direct environmental impacts to indirect impacts on wild fish health and productivity. A well-defined risk management framework, which embodies a clear understanding of unacceptable potential harm, taking precautionary steps where relevant and fully engaging the public throughout the entire risk-management process can help to clearly communicate where there are environmental risks, and can address both environmental sustainability issues and public concerns.

Comment [TT2]: What about the Territories?

Comment [TT3]: This should not be defined here. The framework should identify the risk/harm which is characterized later.

Fisheries and Oceans Canada's (DFO) mandate relates to the conservation of fish and fish habitat and ~~This applies equally to both fisheries as it does to decisions related to and~~ aquaculture. The starting point for any decisions made by DFO regarding human activities around waterbodies in Canada, including aquaculture, is founded on three key pieces of federal legislation: the *Fisheries Act*, the *Oceans Act* and the *Species at Risk Act*. Consequently, in executing the Department's fiduciary duty, the conservation of fish and fish habitat requires the conservation of biodiversity within the ecosystem, and the habitat and productivity of fish species. Given the complexity of ~~detecting or monitoring~~ changes in biodiversity or productivity, proxies ~~often~~ are used as practical measures for managing the environment. Therefore, the threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species.

Comment [TT4]: It is conceivable that almost any activity has the potential to cause harm (hence the need for assessment) but isn't the goal to identify those that have a higher likelihood or probability? The only true measure of this would be once the threshold is passed but by then it is too late.

~~In addition~~ Also, there are international commitments and best practices that are relevant to the management of human activities. The Rio Declaration of the UN Conference on Environment and Development (UNCED) supports the right of sovereign states to pursue responsible economic development opportunities as long as other member states or future generations are not negatively impacted by such developments. The notion of the Precautionary Approach (PA) is geared towards large-scale threats, especially when the consequences are serious or irreversible (e.g., climate change).

Comment [TT5]: Not sure how we actually got to this conclusion here. Is this wording directly from one of the Acts or is this the basis for the framework?

Comment [TT6]: Clearly there are many of these with varying degrees of applicability here. Why this specific example?

Comment [TT7]: Expand?

Comment [TT8]: Again, seems some linkage is required here for context.

Many governments apply the precautionary principle as part of an overall risk management framework to activities that may not potentially result in large-scale or permanent environmental impacts, but may be activities that have societal concern. It is within this context, that DFO applies precaution as required in delivering its regulatory and legislative responsibilities for aquaculture.

Comment [TT9]: The reverse is also true but not noted but perhaps more problematic is that both scale and duration (i.e., permanent) are not well defined here or elsewhere in the document. For example, is large-scale a bay, a part of a bay, or the entire ocean? Similarly is permanent measured in a government's term, a human generation or geological time?

¹ FAO - The State of World Fisheries and Aquaculture 2018

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The following risk management framework for aquaculture is consistent with the overarching Sustainable Fisheries Framework. It also builds on the 2008 Aquaculture Policy Framework (APF) and specific policies developed to support DFO's B.C. Aquaculture Regulatory Program (BCARP).

Field Code Changed

Field Code Changed

Moreover, this Framework is not meant to create any new legal obligations to apply precaution. DFO's role in regulating the aquaculture sector is fundamentally linked to, and is consistent with, the overarching Sustainable Fisheries Framework. (SFF). The SFF provides the foundation for an ecosystem-based and precautionary approach to fisheries management in Canada, and provides the basis for ensuring Canadian fisheries are conducted in a manner which support conservation and sustainable use. Ultimately, through integration with the broader SFF, the residual effects of aquaculture on fish and fish habitat, following all mitigative actions, ensures that these effects can be taken into account in the sustainable management of fisheries.

Field Code Changed

DFO'S Approach to Aquaculture Management

Aquaculture Management Objectives

The overarching departmental aquaculture management objective is to create the conditions for a successful and sustainable aquaculture industry across Canada. Within the overall objective, the department's goal for aquaculture is to ensure that fish and their habitats are protected using regulatory mitigation, monitoring and compliance approaches that are efficient, effective and aligned with the potential risk to the environment, and integrated (to the extent possible) with broader fisheries management approaches. Specifically, the **threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species**. Recognizing that aquaculture is managed federally and by provincial and territorial governments, the department's overall assessment of risk will consider risk management and mitigation measures by all regulatory partners.

Comment [TT10]: As above, it seems this wording should be scoped more.

Comment [TT11]: How consistent is this with the SARA concept of acceptable harm? Is it simply the opposite wording?

Comment [TT12]: In some places it is Fed/Prov but here territories are included. Seems this should at least be consistent within the document.

An Ecosystem and Precautionary Approach

Ecosystem approaches recognize that humans are part of, and have significant influences on, their environments. In aquaculture management under an ecosystem approach—as in fisheries management more broadly—regulatory decisions consider the impact of human activities on fish species, habitats, and the ecosystem of which these species are a part, and take into account broad ecosystem changes related to ~~weather and climate~~. While it is recognized that all habitats, species, populations and communities play a role in aquatic ecosystems, some are more important from an ecological perspective and some are more resilient than others.²

Comment [TT13]: Consider linking explicitly to EBSAs and/or ESSs. Maybe some examples?

DFO incorporates a precautionary approach within its ecosystem approach to fisheries management decision-making, supporting the economic use of resources while ensuring that

² Principles of Ecosystem Based Fisheries Management: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/ecosys-back-fiche-eng.htm>.

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potential risks to aquatic environments are managed to prevent minimize harm to fish populations and habitat, and to limit other less serious harm to the extent feasible given available technology and costs. Management decisions often are more cautious when scientific information is uncertain, unreliable or less complete.³

Implementing an Ecosystem Approach in Aquaculture

An efficiently and effectively applied ecosystem approach for managing aquaculture in Canada includes risk management that considers potential environmental impacts holistically to enable the evaluation of ecosystem level impacts. This integrated strategy is supported through a risk management framework. The holistic evaluation of impacts is supported by the use of the Pathways of Effects (PoE) model for aquaculture (see next section).

Taken as a whole, this approach is designed to support the consistent regulatory management of related aquaculture activities while identifying location, species or operational-specific factors that may influence the extent of the impact on the environment in a particular situation.

Aquaculture Environmental Risk Management

There are five major elements in the Department's approach to managing the environmental risks that may arise due to aquaculture activities (Figure 1, below).

- (1) Defining the environmental and ecosystem objectives for aquaculture activities in Canada: these objectives are defined within legislation, through intergovernmental and international agreements, and consideration of societal values;
- (2) Issue identification: these can be identified through the results of scientific research, monitoring of environmental changes, and/or through public engagement;
- (3) Risk assessment: the science-based characterization of the likelihood and consequence of an activity and assessment of the overall risk, based on the current state of knowledge, and, the identification of uncertainty;
- (4) Risk management: this includes the assessment of how to address uncertainties identified risks through applying regulatory and precautionary measures and options for regulatory measures (mitigation and compliance/effects monitoring), and management decisions on mitigation, monitoring, and licencing; and,
- (5) Monitoring and evaluation of the activity against the identified risks and management actions.

Throughout this process, communication and feedback are critical.

Integral to this process is that management decisions are based on many considerations, including, but not exclusively, scientific, social, economic, cultural and political. It is important to note that not all aquatic areas require equal levels of protection, as not all areas are equally ecologically or biologically significant or vulnerable.

Comment [TT14]: Can't actually prevent in this case.

Comment [TT15]: Not clear how a multi-stage approach to harm is being defined/used here. What does less serious look like?

Comment [TT16]: Isn't this precautionary? It seems cautious and precautionary shouldn't be used interchangeably as they are different.

Comment [TT17]: Wouldn't this framework also allow consideration of other levels? This could be quite useful if there is a specific sub-ecosystem level impact managers were trying to avoid.

Comment [TT18]: But there are other potential approaches that could be used. Is DFO committed to PoE even though these are very resource intensive and some situations might allow alternative approaches to be used? Are PoE libraries complete for aquaculture? Perhaps more problematic is the fact that risk determination is not clearly articulated outside of PoE (which are not a risk assessment tool).

Comment [TT19]: Assume this includes spatial extent, temporal duration and some measure of magnitude/persistence?

Comment [TT20]: I can see that the overarching objectives would be National but in this context (including Fig 1) isn't there scope for this applying to specific activities in specific locations. This would be more consistent with the typical scoping phase that would be next.

Comment [TT21]: To me this is much more than just dealing with the uncertainties.

Comment [TT22]: Agree this needs to be highlighted but also important to note somewhere that the risk of the aquaculture activity is evaluated for each area specifically. This hasn't really been explicit in the document to this point.

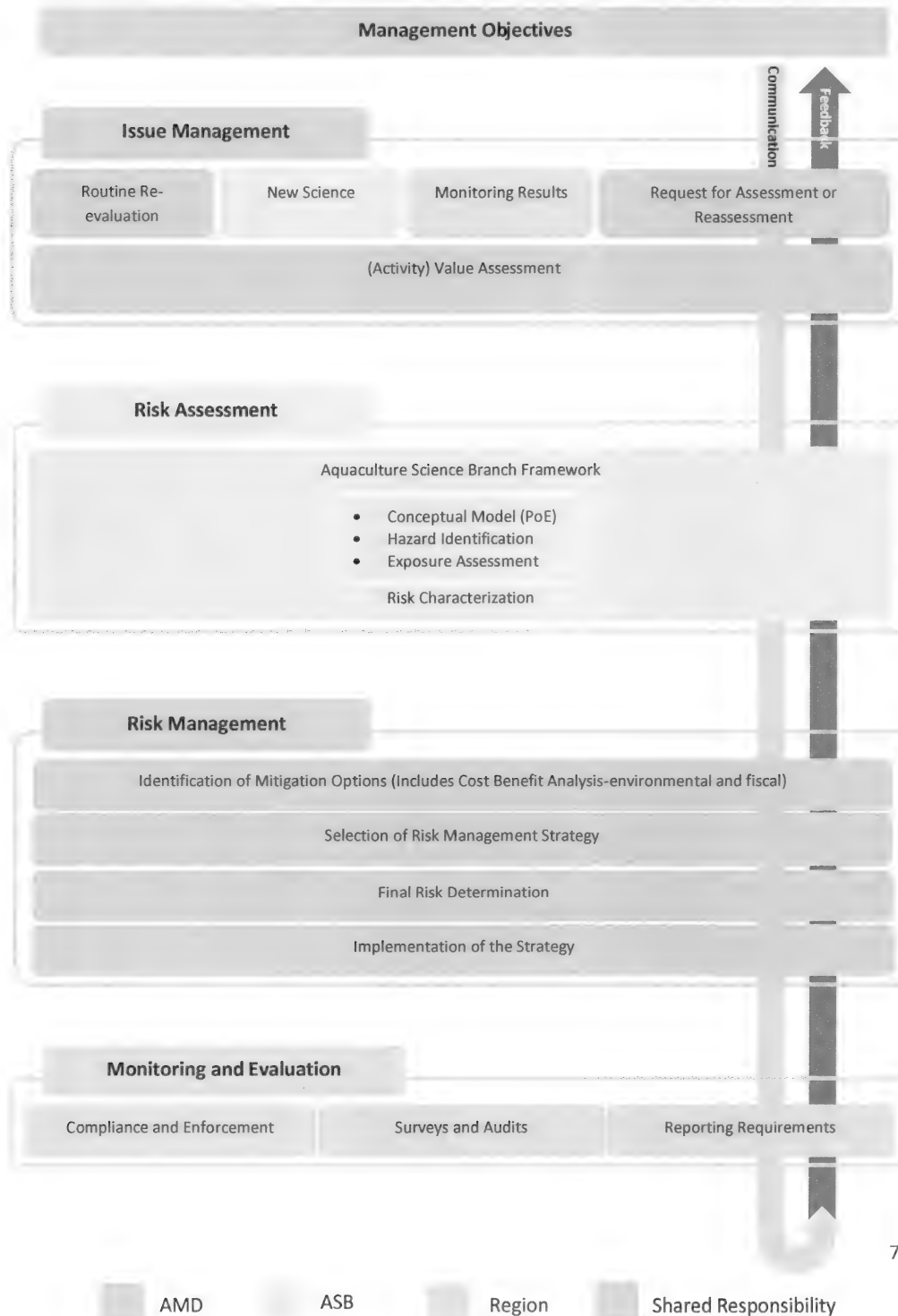
³ A Fishery Decision-making Framework Incorporating the Precautionary Approach: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm>.

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Figure 1: Aquaculture Environmental Risk Management Framework



Comment [TT23]: I get the idea of the communication/feedback arrows but despite potential cluttering of the diagram there are important loops within each of these elements as well.

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Management decisions should also take it into consideration, as may be available, Indigenous Peoples traditional and ecological knowledge.

Comment [TT24]: I would argue this statement is too restrictive and that TEK/LEK be incorporated in all elements where possible.

This approach supports management decision-making with respect to both (1) the setting of broad management (mitigation and monitoring) measures, such as siting criteria and general conditions on operations; and, (2) the consideration of individual applications (e.g., new or amended licences), ~~focussing~~ focusing resources on risks that are unique to the proposed application.

Pathways of Effects (PoE) Model

A Pathways of Effects (PoE) model is a tool that can convey complex interactions between human activities, the stress they can place on the environment (pressures), and environmental effects or impacts. ~~The model operates on the premise that human activities can place stress on the environment which, in turn, can lead to various environmental effects. The model recognizes that a single source activity can result in one or more environmental stressor and that these environmental stressors can have multiple source activities and can lead to one or more environmental effects. It also recognizes that a single environmental effect can be influenced by one or more stressors or activities.~~

Comment [TT25]: Should we also note what PoEs might not do as well with respect to cumulative effects?

PoE diagrams group similar components together at each level in the model (activities, stressors and effects), noting inter-linkages in text descriptions of the environmental considerations. These diagrams and descriptions are designed to communicate information in a manner that facilitates the consideration of overall impacts on the environment, and the ecological benefits and costs of various potential management measures, including interactions between measures and cumulative impacts.

Comment [TT26]: It seems more accurate to say that PoEs are a tool that allow managers to consider the potential ecological costs/benefits of actions. The tool itself doesn't do this per say.

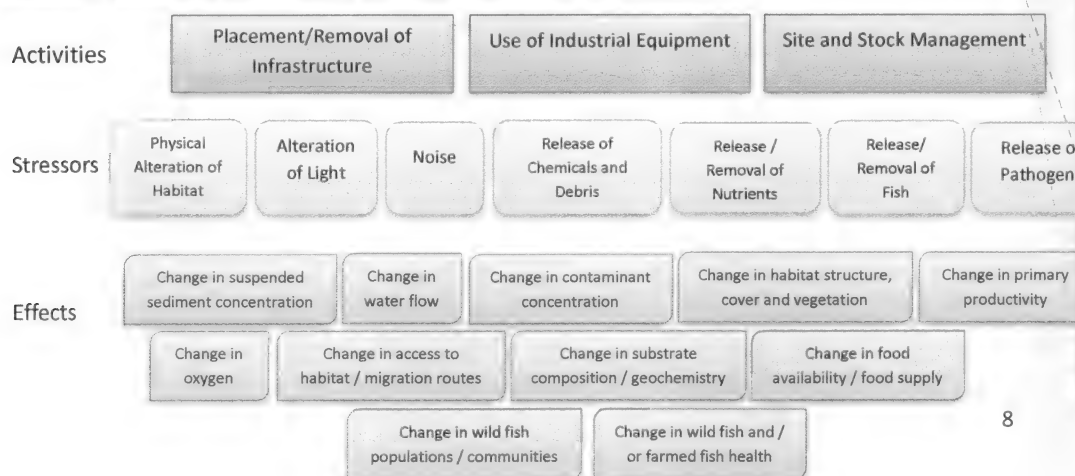
The scientific basis for links between aquaculture activities, stressors and effects was peer-reviewed through DFO's Canadian Science Advisory Secretariat process, and the summaries of the scientific state of knowledge for each of the stressors. This information is available for use in the evaluation of aquaculture activities and the identification of where management intervention may be required to protect fish and/or fish productivity/populations.

Comment [TT27]: Disagree, the tool won't tell you if the cumulative impacts unless the assessor specifically knows how multiple stressors interact at each site/assessment area. Clearly DFO is working on this but I think it is premature to state strongly here.

Comment [TT28]: Link?

Comment [TT29]: Incomplete sentence

Figure 2: Pathways of Effects for Finfish and Shellfish Aquaculture



Comment [TT30]: I think this document should highlight that Fig 2 is a potential starting point but there could be additional activities, stressors and effects (not shown) that could be important in specific cases and added to the PoE model to be considered in the RA.

Comment [TT31]: So is this set in stone because it is based on existing CSAS advice? Seems there are other activities, stressors or effects that could be considered. Also, not clear why the text below only focuses on stressors, especially if this has already been approved. To me it might be more informative to walk through a chain (activity-stressor-effect) rather than brief review of stressors.

Field Code Changed

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At the specific aquaculture application level, the linkages between each of the stressors and the relevant effects are considered. The specific environment and activity will determine which stressor-effect linkages exist, and what mitigation measures can be used to effectively and sustainably break the stressor-effect linkages.

- **Physical alterations to the habitat** occurs when activities related to placing or removing physical infrastructure (e.g. net pens, longlines, rafts, anchors and moorings, shellfish beach culture structures), as well as during the use of husbandry equipment (e.g. underwater lights to increase growth in marine finfish or acoustic deterrent devices to discourage predators⁴).

The extent and impact of the predicted physical alterations to habitat are considered primarily during the pre-operational stage (e.g. site application), which includes an evaluation of the type of benthic habitat in the area being proposed for aquaculture.

- **Release of chemicals and debris** occurs primarily with activities associated with site and stock management, and the use of operational equipment where chemicals and debris may be released. Examples include the use of pesticides, drugs and antifouling agents, and the use of materials in construction (e.g. steel, wood, floatation) and operations (e.g. feed bags, ropes), which can be lost from sites as debris.

The effect of the use of pesticides, drugs and antifoulants on the receiving environment, including on non-target organisms, is assessed by Health Canada.

- **Release of organic and related matter** occurs as a result of stock management activities (e.g. the feeding and cultivation of fish, removal or natural sloughing of biofouling organisms from physical infrastructure) that have an organic or related component (e.g. nutrients).

The predicted extent of organic deposition on the surrounding seafloor is assessed at the pre-operational stage. As part of the on-going operational compliance, marine finfish aquaculture operations must meet a performance-based regulatory requirement related to the release of organic matter.

- **Removal of nutrients and organic matter** occurs as a result of stock management activities where some cultured species (e.g. bivalves) remove particulate matter, nutrients and oxygen from the water column.

The predicted extent of the removal of nutrients on wild populations is assessed at the pre-operational stage.

Comment [TT32]: But how is risk assessment being linked to PoE? I think this document needs to articulate how the major risk components (likelihood and impact) will be determined/quantified. The PoE will only articulate the relationships, the specifics for the RA will need to be determined and subsequently can be adjusted when management actions are considered.

Comment [TT33]: Isn't reduction in pressure an option here? Does it always have to break the relationship?

Comment [TT34]: And other related components or just organics?

⁴ Note that the use of acoustic deterrent devices is not a current practice in Canadian aquaculture.

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- **Release or removal of fish** occurs primarily as a result of stock management activities.

The removal of fish is considered and managed as bycatch. This occurs when some individual wild fish may be temporarily or permanently removed from waters along with cultured fish (e.g. during grading or at harvest), or as part of biofouling or predator control.

The addition of fish to the environment occurs either as a result of intentional stocking of cultured fish into aquatic environments for cultivation (e.g. salmon enhancement), or as a result of unintentional release of fish (e.g. escapes).

The impact on wild populations from the unintentional release of cultured organisms is considered at the pre-operational stage, and is also linked to fiduciary responsibilities associated with the *Species at Risk Act*.

- **Release of pathogens and pests** occurs associated with site and stock management. The increase in biomass of fish within an aquaculture site can influence the presence or abundance of fish pathogens (e.g. bacteria, viruses) and pests (e.g. sea lice and tunicates).

The introduction of pathogens or pests is evaluated at the operational stage, primarily by the Introductions and Transfers Committees (ITC). Conditions of licence outline mitigation measures for the management of the abundance of pathogens or pests.

Additionally, notifiable diseases are regulated by the Canadian Food Inspection Agency.

Additional details on the characterization of each of the stressors, the current status of regulatory thresholds, and current management and mitigation practices are found in Annex 1. Also, a case study for the management of sea lice in B.C. is found in Annex 2.

Stakeholder and Indigenous Peoples' Engagement

Stakeholder and Indigenous peoples' engagement to support sound aquaculture governance is critical. The lack of social licence is a major barrier to robust aquaculture growth. Other factors, including the type of regulatory regime or site-specific development capacity characteristics, may play a role, but not to the same extent as societal acceptance. The best mechanism for sustainable growth is via coastal zone and area-based management approaches which fully engage interested stakeholders and indigenous groups, who may actually contribute to decision-making. These processes not only support general agreement of where sites should go, but also the areas of greatest concern to focus on.

It should be recognized that some risks are new or emerging, and the evolution of scientific knowledge may influence society's tolerances and its chosen level of protection. An understanding of the "public's tolerance for risks" or "society's chosen level of protection" underpins the need for high transparency, clear accountability, and meaningful public involvement and communication.

Comment [TT35]: I'd suggest noting AIS separately in Fig 2 and associated text.

Comment [TT36]: We also have conditions of licence to limit the inadvertent movement of AIS (at least in BC). This should be noted as well.

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Two-way sharing of information and the inclusion of a range of perspectives in the decision-making process can become the cornerstone of openness and transparency, and enhance credibility of and trust in the decisions that the Government develops.

Conclusion

DFO has managed aquaculture over the years based on managing environmental impacts and the potential risks these can pose to fish habitat and fish populations, as identified through the DFO peer-reviewed science process. Where relevant, DFO regulators strive to develop management standards or thresholds, which are informed by science, based on best practices globally, and have received some form of stakeholder and indigenous peoples' input.

Aquaculture management is a shared responsibility between the federal and provincial governments; thus, management frameworks need to be foundationally the same. In circumstances where there is a potential for unacceptable harm to fish (population-level effects), it may be appropriate to make decisions and implement precautionary measures in the near term, without having full certainty of the probability or magnitude of harm. Close monitoring would also occur to assess the effectiveness of the measures in addressing mitigating risk and overall impacts. Follow-up activities, including research and monitoring, are key to reducing scientific uncertainty and allow improved decision makings to be made in the future. Finally, stakeholder and Indigenous peoples' engagement throughout the risk management process is critical, not just at the final decision-making process.

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Annex 1: Details on Aquaculture Stressors, Effects and Risk Management

STRESSOR	THRESHOLD	MANAGEMENT ACTION / MITIGATION
<p>Release of pests and pathogens</p> <p>Pathogens can be endemic in wild fish populations (i.e., occur naturally in wild populations in a region) or exotic (i.e., occur naturally in other locations and have been introduced in a region). The presence of endemic pathogens can be amplified under some circumstances where fish are in close proximity (e.g. spawning grounds, schooling and aquaculture). Endemic pathogens tend to have a less severe effects on native populations than exotic (or introduced, non-endemic) pathogens, as over multiple generations native species have typically developed an immune response to endemic pathogens.</p> <p>The health status of wild fish often cannot be directly assessed, and changes in wild fish populations or communities due to disease are difficult to determine. Diseased and moribund fish are quickly removed from the population through processes such as predation or mortality; sampling can therefore be easily biased toward healthy individuals. The presence or absence of pathogens is particularly difficult to determine in wild fish populations, nor is there available scientific data to determine the effect of low level presence of pathogens at the individual or population level.</p>	<ul style="list-style-type: none"> • Sea lice threshold (B.C. only); • Mandatory Reporting of Fish Health Events (i.e., treatment or % loss) (B.C. only) 	<p>Conditions of licence require treatment for sea lice above threshold (3 lice/fish in B.C.)</p> <p>Monitoring fish health is a particularly important mitigation tool when cultured fish are destined for movement to another location or for release into aquatic environments. The determination of the appropriateness of planned movements or releases of fish must be based upon a review of the disease and mortality history of the cohort, on recommendations by a qualified fish health professional, on the results of any recommended pre-release disease screening, and on guidance from regulatory agencies.</p>
<p>Release (or removal) of organic matter and nutrients</p> <p>Potential sources of the release of other organic matter include fish carcasses (e.g. from cultured fish or bycatch⁵), feed spillage, faeces,</p>	<ul style="list-style-type: none"> • BOD threshold 	<p>Footprint addressed through initial siting decisions (benthic impact depositional modeling)</p> <p>Performance based threshold (on-going assessment once/production cycle) – under the AAR, sites cannot be restocked</p>

Comment [TT37]: AIS (tunicates) were noted above but no mention here as looks like all finfish. Should this be added as an example for the shellfish world? As noted above there is management related to green crab in BC.

⁵ The release of incidental finfish catch during finfish harvest, as may be required under conditions of licence, may contribute to organic matter in the environment if the fish are dead or have a low chance of survival.

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<p>harvest waste or offal, including blood. Release of organic matter into the marine environment from humans working and/or living on site could also constitute a minor contribution of organic matter to aquatic environments, should it occur. Human waste is generated on boats or in working or living accommodations as part of daily activities like cooking, bathing and bodily functions. The majority of organic matter introduced into the environment from finfish aquaculture will be associated with excess feed and faeces. Accumulation of the organic matter can result in a change in the benthic biodiversity around a site.</p>		<p>if sulphide threshold exceeded</p>
<p>Release of chemicals/drugs</p> <p>Pesticides are assessed by the Pest Management Regulatory Agency of Health Canada for value of use, human, animal and environmental risks under the <i>Pest Control Products Act</i>. Factors considered in environmental risk assessments related to pesticides include the potential transport and dispersal of products and/or their constituents following release into waters, as well as the exposure of non-target organisms to concentrations of substances that could result in lethal or sub-lethal (e.g. behavioural, reproductive) effects. The severity of impacts on exposed non-target species will depend on factors such as the toxicity of the product used, the dosage, the presence of susceptible non-target species / life stages of species, and environmental conditions.</p>	<ul style="list-style-type: none"> No thresholds – Research and analysis underway to provide advice on the design of a post-deposit monitoring program. 	<p>PRMA can place limits on the timing, location and volume of the release of specific materials.</p> <p>Under development – traffic light system for 1) pre-siting assessment to inform site placement, and 2) cumulative impacts [informed by post deposit monitoring program (site level) and aquaculture monitoring program (bay scale)]</p>
<p>Physical alteration of habitat</p> <p>The addition, removal, and</p>	<ul style="list-style-type: none"> Maximum shellfish aquaculture coverage of 7% per bay in some areas of Canada 	<p>Primarily addressed through initial siting considerations.</p> <p>In situations where wild fish may be</p>

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modification of physical structures may affect bottom sediments, benthic communities, pelagic communities, and hydrodynamics.		present only on a seasonal basis, or where habitat is used by a species during a particular period (e.g. during reproductive phases), measures to limit the duration, timing or extent of installation, harvest or site maintenance activities may be warranted.
<p>Release (or removal) of fish</p> <p>Farmed finfish, including salmon, may escape, usually due to equipment failure or human error. Equipment failure may be weather-related, caused by predator attacks or other events that stress the containment infrastructure. For there to be genetic intrusion, establishment of non-native populations, predation or competition, farmed fish must first be released into the wild through escape or the release of viable gametes.</p>	<ul style="list-style-type: none"> • Reporting of escapes may be required, depending on jurisdiction • No <i>direct</i> genetic impact risk on West Coast from Atlantic salmon farms 	<p>Addressed through conditions of licence and development of national containment standards (to be developed)</p> <p>Regulation of fish containment structures and use of triploid farmed fish would further lower the extent of direct genetic interaction.</p> <p>In the event that an unintentional release does occur, measures such as escape response plans may help to recover released fish, particularly where a significant risk of harmful interaction with wild populations has been identified.</p> <p>Escape reporting and analysis of the measures employed may be used to help assess the effectiveness of current mitigation measures and develop future facility or regulatory measures, as appropriate. Measures for recording and reporting cultured fish inventories as well as accurate records of introductions and transfers of licensed species support a broader understanding of the scope (estimated quantity, species and timing) of unintentional releases, and may form part of the management approach in mitigating their effects.</p> <p>In circumstances where a new species is being considered for rearing in an area for the first time, a specific environmental risk assessment is warranted to determine whether or not an Introductions and Transfers licence should be issued (see National Code on Introductions and Transfers LINK). The Code provides guidance that the I&T risk assessment should typically focus on incremental risk aspects that are particular to that species. Species identified as higher risk may have special regulatory conditions imposed on</p>

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		<p>them to bring the risk to an acceptable level. Where risk outcome warrants, some species may not be authorized for culture. An I&T risk assessment may also be warranted where a species is native to the province but new to culture. In terms of risks related to release of fish, the assessment should start by focussing on the probability of the cultured gametes interacting with wild fish populations, and in the case of finfish, the potential for escaped fish to interact and compete with populations of the same or other species.</p>
<p>Noise</p> <p>Noise associated with aquaculture operations may be produced incidentally during the routine operation of equipment such as aerators, feeders, generators and power washers, and by vessels servicing aquaculture facilities. The effects of such noise are expected to be localized, short-term and likely insufficient to cause injury or permanent displacement to marine organisms.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p>
<p>Alteration in light</p> <p>Measurements of light penetration around net pens show that little visible light is found outside the pens, which suggests that the use of lights in aquaculture will have minimal and mainly local ecological effects.</p>	None	<p>Addressed through initial siting considerations and conditions of licence</p> <p><i>In B.C. is there still a requirement to report the use of lights?</i></p>

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Annex 2: A Case Study- Management of Sea Lice in B.C.

1. Description of Stressor and Potential Impact – Sea Lice

Environmental

The release of pathogens or viruses from aquaculture facilities through site and stock management is a stressor described in the Canadian Science Advisory Secretariat (CSAS) research document “Pathways of Effects for Finfish and Shellfish Aquaculture” (PoE). The primary effect associated with this stressor, as described in the PoE, is a change in wild fish and/or farmed fish health. Additional sea lice specific science advice has also been provided, and this case study and analysis draws on this advice⁶.

Sea lice are endemic to the Pacific Coast and are found on several species of Pacific salmon and non-salmonid species. They are also present in other areas of the world where Atlantic salmon reside, such as Norway and Scotland. There are a number of sea lice species throughout the world that have a range of hosts and life cycle characteristics. The species of concern in B.C. from an aquaculture perspective is the *Lepeophtheirus salmonis* (Salmon louse); however, there is another species, *Caligus clemensi* (Herring louse) which can occasionally cause concern in aquaculture facilities. The sea lice life cycle includes numerous stages, such as: the free-floating Nauplius stage, infectious copepodid stage, attached chalimus stages, and finally the motile stages (pre-adults, adults).

Farmed Atlantic and Pacific salmon are stocked at the marine sites free of lice and infection occurs by exposure to passing adult wild salmon. This is known as “spillover.” The intensity of infestation on farmed salmon is based on a number of factors including the size of the wild salmon run, sea water temperature, salinity and the health of the farmed fish. Cultured Pacific salmon are less susceptible to sea lice infestation than Atlantic salmon. When infestation occurs at a farm the sea lice numbers may become internally amplified, which may result in “spillback” to wild salmon. Of particular concern is the effect this may have on juvenile salmon smolts which have recently entered the marine environment as they are most susceptible to sea lice. Wild salmon smolts out-migrate from their natal streams during the spring and early summer. A corresponding “out-migration window” with different requirements for management of lice levels is incorporated into the licence conditions. The out-migration window as currently defined runs from March 1st until June 30th annually.

Social

There is a high level of concern from a segment of the public, some First Nations and ENGOs, on

⁶ Assessment of Sea Lice Monitoring and Non-Chemical Measures, DFO 2014 [SAR 2014/006](#)

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the impact aquaculture has on wild Pacific salmon, and more specifically belief that sea lice can significantly negatively impact wild salmon populations. Wild salmon populations can be highly variable and in some cases a low run in one year can be followed by record high numbers; this happens in areas both with and without aquaculture facilities on migratory routes. Conflicting opinion about the possible impact of high levels of sea lice has not given these groups, governments, the media or the Canadian public a level of comfort that the Department is properly managing the risk the aquaculture industry may pose to wild salmon.

2. Current Management and Mitigation – Sea Lice

The goal of the current management approach is to ensure that no disease or disease agent negatively impacts the protection and conservation of fish. Presently, risk related to sea lice is managed through licence conditions and the Fish Health auditing program.

Pre-Operational Management Approach

The Precautionary Approach is applied during the consideration of new sites, both from a site-specific and broader area perspective. This is also true for applications for increased production at an existing site. There is recognition of the potential risk of increased sea lice abundance and corresponding infection of out-migrating salmon from licenced facilities as a result of increased production. Assessments including the history of sea lice abundance levels at that farm and neighbouring farms in the general area include recommendations for mitigation measures, such as area-based management (e.g. coordinated and timing of stocking, fallowing and sea lice treatments), maintenance of single-year classes, practicing integrated pest management, and timing of stocking to reduce the need for sea lice treatments. Geographic elements considered during the assessment include hydro-connectivity between the proposed site and adjacent farms, and proximity to known salmon migration routes.

When siting new facilities, efforts are made to avoid the siting of new aquaculture facilities in areas which are known to be important wild fish migration routes, nurseries, sensitive habitats, or have other importance to wild fish populations or significant to First Nations. Ongoing science and research forms part of this consideration.

Current Operational Management Approach

The licence conditions include sea lice monitoring protocols as well as sea lice abundance thresholds that a licence holder cultivating Atlantic salmon must abide by. This threshold is set at an average of three motile (pre-adult and adult) lice (*Lepeophtheirus salmonis*) per fish. During the outmigration period, salmon farmers are required to maintain lice levels below the three motile lice threshold. Outside this period, they are not obligated to maintain this threshold, but must notify DFO when they exceed it and develop a mitigation strategy for consideration by DFO officials. This system allows for lice control during the sensitive out-

Comment [TT38]: But it often is impossible to reach agreement on opinion which is where scientific evidence comes in. Clearly there are many factors affecting salmon productivity year to year and aquaculture may or may not be contributing. Thus, the strength is in a robust approach that considers or even quantifies these in a way that is clear to stakeholders and FN. In many cases this will include new science but should this be linked also to near- and far-field effects work or environmental monitoring?

Comment [TT39]: Not sure what this means

Comment [TT40]: But clearly this is only part of the process as I'm sure decisions have been made to allow activities in areas that at least one stakeholder/FN group would consider significant/important to them. It may help to frame this in the context of the various factors that feed into management decisions but that at the end of the day, when precaution is considered, decisions are made that might not be agreeable to all.

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migration period, but does not require treatment outside this period, thereby reducing the use and potential development of resistance to various sea lice therapeutants. Sea lice sampling on farms is required every two weeks at minimum during the out-migration period, and DFO auditing of the reported numbers and sampling methodology occurs on 50% of all active farms during this time. For the remainder of the year, sampling by industry is only required once per month, but will increase to every two weeks if threshold levels are exceeded.

Mitigation

Companies are increasingly moving towards an area-based management approach where all smolts in a given area are the same year-class and, if treatments are required, they are coordinated between these sites. Treatments are ideally timed in coordination with returning adult wild fish so that all wild fish have left the area before treatment is initiated. This is to avoid reinfection and retreatment which can lead to resistance. Currently the primary sea lice treatment is the use of emamectin benzoate (SLICE), which is an in-feed parasiticide.

In some areas in B.C., SLICE resistance has emerged in recent years. Industry is rapidly developing alternative treatment modalities to curtail SLICE resistance, and prevent the development of wide-spread resistance in the sea lice population in B.C. This involves the rotational use of alternative treatment methods, such as novel in-feed parasiticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. Hydrolicer). An alternate method of reducing absolute sea lice inventory is through harvesting, which typically would occur when fish are near harvest weight. This method is only effective if harvesting is done at a rate that reduces a farm's absolute sea lice inventory (as defined in the licence).

3. Scientific Certainty – Sea Lice

A large number of scientific studies have been conducted in recent years which have tried to determine what, if any, harm is posed to wild salmon by sea lice spillback from Atlantic salmon farms. No conclusive evidence has been found to suggest that sea lice originating from farms are causing harm to wild stocks on a wide scale. This has largely been accepted by stakeholders and opponents to the salmon farming industry. This indicates that the three motile threshold is sufficiently conservative to mitigate risk to wild salmon posed by sea lice originating from farms. In the rare instances where farms have not been able to control lice levels during the out-migration period (often as a result of SLICE resistance), lice levels are found to be higher on out-migrating salmon smolts. This indicates that lice management on farms is vitally important to prevent an undue lice burden on wild smolts.

Comment [TT41]: Seems an odd title!

Comment [TT42]: So they are causing harm on smaller scales? This wording should be more specific.

Comment [TT43]: Since the title of this section is scientific certainty do we actually know how confident we are in the 3 motile threshold? If we are at 4 are we in the realm of major impacts? It seems there is additional work required to better understand if we might be stacking precaution on precaution which would have a cost to industry.

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4. Residual Risk and Application of the Precautionary Approach – Sea Lice

Environmental

A changing climate makes future lice mitigation more uncertain and challenging. In years with warmer water temperatures and increased salinity the management of lice becomes more difficult. This is likely to become more common as time progresses. Additionally, the emergence of SLICE resistance on B.C.'s coast has presented a significant challenge to industry for effective lice management. The adoption of additional treatment options by industry is very welcome and has demonstrated that lice levels should be able to be effectively controlled, despite a changing climate and without sole reliance on SLICE. Effective management is vital to ensure that wide-spread resistance to lice therapeutants does not occur as it has in other jurisdictions. Ongoing research into the genetic determinants of lice resistance, use of cleaner fish, alternative treatments and alternative cage designs/husbandry methods are all very promising, and should be encouraged and supported to allow proactive management by industry. Under the present management regime, the residual risk once operational is determined to be medium. Application of the Precautionary Approach requires that the Department utilize existing and potential new management measures to ensure that the risk stays within an acceptable range.

Comment [TT44]: But the RA should have a timeframe identified, usually this is done at the scoping phase so the risk calculations have an actual basis. Where is this defined?

Comment [TT45]: What does this mean? The actual determination of risk would include mitigative measures already so is this some down weighted formulation? Based on framework above it seems there should have been a risk calculation based on the PoE. It is also not clear that residual risk is entirely related to uncertainty nor is it articulated how uncertainty is characterized/quantified/used in the RM element.

Comment [TT46]: As defined by management?

Comment [TT47]: So normally a RA table would indicate likelihood and consequence. What does context and attributes actually relate to? Further, who determined the underlying colour scheme? This is often determined based on risk tolerance and so it is very unclear how RA and RM are actually being applied in this working example. If not transparent it won't be possible to replicate nor will stakeholders/FN believe the process is transparent.

Comment [TT48]: Is this part intended as a full SE RA?

Comment [TT49]: Again, I think there is confusion over residual risk and uncertainty.

Comment [TT50]: That better characterizes spatial and temporal variables contributing to observed variability/understanding?

Comment [TT51]: But this is based on some expectation of the underlying belief systems of stakeholders/public/FN which I suspect we've not characterized well.

Context	Risk Attributes		
		High	Moderate
	High		
	Moderate		X

Social

Based on the level of scientific certainty that sea lice are not causing harm to wild fish populations the level of concern raised by the public is expected to diminish over time. Due to the variable nature of salmon returns there may continue to be a perception that declines in salmon populations are related to sea lice impacts. As noted above, environmental residual risk exists based on changing climate conditions. It is incumbent on DFO to ensure a robust scientific program remains in place to better understand how the change in climate conditions is affecting sea lice, and their interaction with farmed and wild fish. If this scientific research along with changing management requirements (as necessary) is communicated to the public in a pro-active manner, social acceptance should increase.

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	Risk Attributes			
Context		High	Moderate	Low
	High			
	Moderate		X	
	Low			

Comment [TT52]: So this is saying SE risk is Moderate ? Really not clear how this was determined and similar comments on risk calculations and risk management considerations affecting the underlying colour scheme.

5. Next Steps and Future Developments – Sea Lice

DFO conditions of licence relating to lice have been found to be vague, outdated and sometimes unenforceable. Some preliminary ideas on changes to the licence to allow better regulation, while also providing additional tools and guidance to industry, include:

- Consider moving to adult female-based threshold, rather than current motile threshold.
- Establishment of a farm-based, in addition to a fish-based (as currently used), sea lice threshold (For example, we assume 500 000 fish on farm, with three motiles = 1.5 million lice allowable on a single farm).
- Harvest would no longer be deemed an appropriate management action within the out-migration [would only be used to lower farm-based “absolute sea lice inventory” below farm-level threshold (as mentioned above) before entry into out-migration].
- Change licence condition of “active farm” away from number of pens stocked (more than 3), to absolute number of fish on site for a given time (e.g. active site could be defined as: more than 30 days have passed since the introduction of more than 50 000 fish to a sea site).
- Consideration be given to initiating mandatory sea lice reduction prior to March 1, which is the generic time when out-migration is recognized to start, as stated in licence conditions.
- Implement mandatory post in-feed lice treatment reporting to better monitor efficacy.
 - E.g. 25-30 days have passed since the completion of treatment with an in-feed parasiticide medication.
- Implement prohibition on use of lice chemical therapeutant for a time in response to resistance.
 - E.g. treatment failure could be defined as: “failure to achieve > 60% reduction in pre-treatment lice numbers at the 25-30 day post-treatment counts”.
- SLICE use would be prohibited at that site again during the calendar year.

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Moving forward the Department must continue to do scientific research on sea lice and its relationship to farmed and wild salmonids in order to develop a clearer understanding of the possible linkages between the two and the corresponding risk to cultured and wild fish. It should also be cognizant of, review related independent science (science which comes from sources outside of DFO), and react to key new findings by adjusting our research objectives. Operationally DFO must adapt to new science, making changes to present management approaches as necessary.

Although the risk posed by sea lice is considered low based on our present scientific understanding, a Precautionary Approach to the siting of new farms in the future could incorporate the potential of sea lice becoming a higher risk because of changing environmental conditions.

Comment [TT53]: How was this determined? Presumably this is a different calculation than what is presented in both « risk tables » where the residual risk was moderate (which actually implies the original or unadjusted risk was at least as high if not higher).

Over and above the current operational management approach it is recommended that a risk-based traffic light system be implemented that would be tied to some objective measure of sea lice abundance (e.g. number and severity of exceedances). This approach could amalgamate information from an individual farm or a number in a geographic area that have hydro-connectivity. It is well established that sites which have good overall fish health performance, including a low sea lice burden, are less likely to become susceptible to disease.

A green designation would indicate that historically a site has good sea lice management with rare incidences of threshold exceedance and low or negligible mortality indicating a low residual risk to wild salmon. The Department could consider increases in production at these sites. A yellow designation would indicate some recurrent sea lice threshold exceedances that are able to be managed on site without the risk of associated fish health issues and do not represent a notable threat to wild salmon. Increases in production would not be considered and additional management measures may be required. A red designation would indicate serious, significant or repeated sea lice exceedances that could potentially represent a notable threat to wild salmon. Drastic management measures could include reducing authorized production, a requirement to fallow for a significant time period, or cancellation of the licence.

Comment [TT54]: So are these levels based on the PoE/RA/RM elements? Not sure of the basis for these conclusions.

At present there is a lack of flexibility in the licence conditions to require actions such as those outlined for farms designated red as the Department does not have the legislative authority. Moving forward the Department should pursue legislative/regulatory changes to obtain this authority.

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APPENDIX I: Marine Finfish Pre-Operational Risk Table

There are a number of elements that are already assessed at the pre-operational application stage and the risks are summarized for senior management in a table.

Farm name:	Company:			
Elements Assessed – Wild Fish and Fish Habitat	Low	Med	High	N/A
Presence/use and interactions with CRA fishery or rare species				
Presence of important fish habitat (e.g. sponge reefs, rockfish nursery, etc.)				
Presence/use and interactions with SARA listed species				
Appropriate distance to salmonid-bearing streams				
Appropriate distance to important herring spawn areas				
Appropriate distance to shellfish beds				
Appropriate depth, currents and benthic substrate				
DEPOMOD predictions acceptable				
Existing seabed conditions (e.g. capable of assimilating waste)				
Historic benthic monitoring results				
Use of lights				
Marine mammal usage & mitigation				
Elements Assessed – Fish Health	Low	Med	High	N/A
Diseases of concern on farm, nearby farms, and in area (if known)				
History of appropriate disease management on farm and nearby farms				
Prudent history of medicant use (if known)				
Hydrological connectivity with other farms & co-management plan(s)				
History of compliance and reporting on FH and SL				
Adequacy of submitted FHM, SOPs and Carcass Management Plans				
Water quality (e.g. DO, water flow; if known) & mitigation				
Natural challenges (e.g. plankton issues, harmful algal blooms; if known) & mitigation				
Fish density appropriate to maintain good FH (if known)				
Species intended to be grown is appropriate for the area				
History of predator stress & mitigation (if known)				
Elements Assessed – Sea Lice	Low	Med	High	N/A
Natural occurrence of sea lice at site				
History of staying below sea lice thresholds during smolt out-migration				
Appropriate use of available tools to manage sea lice in future				
Elements Assessed – Existing Fisheries	Low	Med	High	N/A
CSSP closure on bivalve shellfish beds used in CRA fisheries				
First Nations FSC fisheries/site access				
Commercial fisheries (direct or indirect displacement – reduction in stock				
Recreational fisheries (direct or indirect displacement – reduction in stock				
EFA/test fishery/research area				
Geoduck beds				

SEPTEMBER 18, 2018 DRAFT

No information has been removed or severed from this page

Jones, Simon

From: Murray, Cathryn
Sent: September-27-18 2:18 PM
To: Therriault, Thomas; Hyatt, Kim; Higgins, Mark; Johnson, Stewart; Sutherland, Terri; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary; Johannessen, Sophia
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Attachments: Review of Aquaculture Risk Assessment Framework_CM_20180927.docx
Follow Up Flag: Follow up
Flag Status: Flagged

Dear Mark,

My review of the draft document is in the attached file. I am available to discuss more widely next week as needed.

Cheers,
Cathryn

From: Therriault, Thomas
Sent: 2018-September-27 1:32 PM
To: Hyatt, Kim; Higgins, Mark; Johnson, Stewart; Sutherland, Terri; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Mark,
Here are my comments on this document.
Also happy to discuss further if needed.
Cheers,
Tom

From: Hyatt, Kim
Sent: Wednesday, September 26, 2018 3:40 PM
To: Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; Johnson, Stewart <Stewart.Johnson@dfo-mpo.gc.ca>; Sutherland, Terri <Terri.Sutherland@dfo-mpo.gc.ca>; Therriault, Thomas <Thomas.Therriault@dfo-mpo.gc.ca>; O, Miriam <Miriam.O@dfo-mpo.gc.ca>; Coyle, Theraesa <Theraesa.Coyle@dfo-mpo.gc.ca>; Pearce, Chris <Chris.Pearce@dfo-mpo.gc.ca>; King, Jackie <Jackie.King@dfo-mpo.gc.ca>; Robinson, Cliff <Cliff.Robinson@dfo-mpo.gc.ca>; Neville, Chrys <Chrys.Neville@dfo-mpo.gc.ca>; Miller-Saunders, Kristi <Kristi.Saunders@dfo-mpo.gc.ca>; Jones, Simon <Simon.Jones@dfo-mpo.gc.ca>; Garver, Kyle <Kyle.Garver@dfo-mpo.gc.ca>; Chandler, Peter <Peter.Chandler@dfo-mpo.gc.ca>; Bianucci, Laura <Laura.Bianucci@dfo-mpo.gc.ca>; Murray, Cathryn <Cathryn.Murray@dfo-mpo.gc.ca>; Dobson, Diana <Diana.Dobson@dfo-mpo.gc.ca>; MacWilliams, Christine <Christine.MacWilliams@dfo-mpo.gc.ca>
Cc: Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Holmes, John <John.Holmes@dfo-mpo.gc.ca>; Kennedy, Eddy

<Eddy.Kennedy@dfo-mpo.gc.ca>; Houston, Kim <Kim.Houston@dfo-mpo.gc.ca>; MacDougall, Lesley <Lesley.MacDougall@dfo-mpo.gc.ca>; Thiess, Mary <Mary.Thiess@dfo-mpo.gc.ca>
Subject: RE: Aquaculture Risk Management Framework and the Application of the Precautionary Approach

Hi Mark! My comments provided in margins of attached document. Let me know if they require any clarification.

Regards, Kim.

Kim D. Hyatt Ph.D.
Section Head, Regional Ecosystem Effects on Fish and Fisheries
Science Branch, Ecosystem Science Division, Fisheries & Oceans Canada
Pacific Biological Station, Nanaimo, BC V9R 6N7
T: 250 756 7217
F: 250 756 7138
Associate Editor, *Canadian Water Resources Journal*, NRC Research Press

From: Higgins, Mark
Sent: September-26-18 12:36 PM
To: Johnson, Stewart; Sutherland, Terri; Therriault, Thomas; O, Miriam; Coyle, Theraesa; Pearce, Chris; King, Jackie; Robinson, Cliff; Hyatt, Kim; Neville, Chrys; Miller-Saunders, Kristi; Jones, Simon; Garver, Kyle; Chandler, Peter; Bianucci, Laura; Murray, Cathryn; Dobson, Diana; MacWilliams, Christine
Cc: Lowe, Carmel; Holmes, John; Kennedy, Eddy; Houston, Kim; MacDougall, Lesley; Thiess, Mary
Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

Dear all,

Some of you have already been contacted with this request, but I wanted to ensure everyone is on the same page. Please find attached the document on which Ottawa is looking for comment. See below for further details. There may be a call/meeting to discuss any comments received sometime next week, so if you could pass any comments to me by Tuesday, October 2nd, that will give us time to assess how to proceed from there. We are hoping that we can get comments from as many as possible before returning this to Ottawa. If you have any questions, please let me know.

Thanks

Mark Higgins
A/Division Manager ADGT
Fisheries and Oceans Canada / Pêches et Océans Canada
Pacific Biological Station / Station Biologique du Pacifique
Nanaimo, B.C. V9T 6N7
Ph: (250) 756-7072
Cell: [REDACTED]
mark.higgins@dfo-mpo.gc.ca

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From: Lowe, Carmel
Sent: September-19-18 12:05 PM
To: Higgins, Mark; Holmes, John; Kennedy, Eddy
Cc: MacDougall, Lesley; Houston, Kim; Patten, Bruce
Subject: FW: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

All – see below and attached.

Mark – I would like you engage the others on this email and provide me with a list of the staff that should be included in a review of this draft approach. I propose we then convene a meeting of those staff and those on this email to conduct the review and provide a consolidated response back to Jay and Ingrid. Let me know if there are any issues/concerns with this proposed approach – and if so, what are alternate suggestions completing the review.

I will ask Catherine to find a time for this regional review meeting during first week of October. I am guessing we will require 2 hours.

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Parsons, Jay
Sent: September 19, 2018 11:48 AM
To: McCallum, Barry <Barry.McCallum@dfo-mpo.gc.ca>; Vézina, Alain <Alain.Vezina@dfo-mpo.gc.ca>; Bliss, Doug <Doug.Bliss@dfo-mpo.gc.ca>; de Lafontaine, Yves <Yves.deLafontaine@dfo-mpo.gc.ca>; Wang, Sen <Sen.Wang@dfo-mpo.gc.ca>; Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>; Laverdure, Louise <Louise.Laverdure@dfo-mpo.gc.ca>
Cc: McPherson, Arran <Arran.McPherson@dfo-mpo.gc.ca>; Moore, Wayne <Wayne.Moore@dfo-mpo.gc.ca>; Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Davis, Ben <Ben.Davis@dfo-mpo.gc.ca>; Meade, James <James.Meade@dfo-mpo.gc.ca>; Sullivan, Mike DJ <Mike.Sullivan@dfo-mpo.gc.ca>; Blair, Tammy <Tammy.Blair@dfo-mpo.gc.ca>; Cooper, Lara <Lara.Cooper@dfo-mpo.gc.ca>; Paul, Stacey D <Stacey.Paul@dfo-mpo.gc.ca>; MacKinnon, Anne-Margaret <Anne-Margaret.MacKinnon@dfo-mpo.gc.ca>; Ouellette, Marc <Marc.Ouellette@dfo-mpo.gc.ca>; Pomerleau, Corinne <Corinne.Pomerleau@dfo-mpo.gc.ca>; Mckindsey, Chris <Chris.Mckindsey@dfo-mpo.gc.ca>; Christie, Gavin C <Gavin.Christie@dfo-mpo.gc.ca>; Geiling, Doug <Doug.Geiling@dfo-mpo.gc.ca>; Kennedy, Eddy <Eddy.Kennedy@dfo-mpo.gc.ca>; Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>; White, Andrea <Andrea.White@dfo-mpo.gc.ca>; Pilcher, Scott <Scott.Pilcher@dfo-mpo.gc.ca>
Subject: Aquaculture Risk Management Framework and the Application of the Precautionary Approach
Importance: High

Le français suit

Colleagues,

As mentioned Monday, a draft Aquaculture Risk Management Framework/Application of the Precautionary Approach has recently been developed, in response to the Minister's request that the Department explain how aquaculture is managed and how the precautionary approach is applied. This supports a number of high profile and public expectations, including the Cohen Commission report, the Minister's mandate letter and the Spring 2018 report from the Commissioner for the Environment and Sustainable Development.

It is important to note that this document is very much still a work in progress. For example, the intention is to balance this document nationally by including additional examples in Annex 2 incorporating east coast applications.

Prior to engaging with the Provinces, Territories and Indigenous Peoples, comments and feedback internally is being sought. Aquaculture Management sent out a version Tuesday to their RDs seeking their comments on the applicability of the framework to aquaculture, and changes and/or improvements.

The attached version is the most recent and current version and should be used for the purpose of review. Unfortunately, it is currently only available in English; the translated version will be sent when it becomes available.

Aquaculture Management has requested feedback by **Friday October 12, 2018**. Therefore, the comments from EOS will also need to be submitted by that time as well.

We ask that you broadly engage the DFO Science community within your region (i.e., in addition to aquaculture staff, also fisheries science and habitat science staff, etc.).

Please send your collated comments, corrections and suggestions to Ingrid Burgetz and Jay Parsons, with a cc to Wayne Moore by October 12th. Ingrid and Ed Porter from Aquaculture Management will then integrate all the comments into the next version. As well, we have been asked to convene a departmental technical review meeting of the document with internal (Science and Management) and external experts. We will soon be approaching you for suggested regional participants (Aquaculture / Fisheries / Habitat Science). This will also be an additional or alternate approach to providing regional input into the document.

Next steps following this include:

- DFO finalization of the document for external consultation, including presentation to the Minister
- DFO Science & Management internal and external technical review (details to be shared shortly)
- Consultations with P/T through the Canadian Council of Fisheries and Aquaculture Ministers
- Industry consultation
- Indigenous consultations
- Public consultation (on DFO website)
- Final posting on DFO's website

Thank you very much to your collaboration and support.

I apologize for the tight timelines, but this file has the express interest of the Minister.

Chers collègues,

Comme mentionné lundi, une ébauche du cadre de gestion des risques liés à l'aquaculture et de l'application de l'approche de précaution a récemment été élaborée en réponse à la demande du ministre voulant que le Ministère

explique la façon dont l'aquaculture est gérée et dont l'approche de précaution est appliquée. Cela appuie un certain nombre d'attentes publiques de premier plan, y compris le rapport de la Commission Cohen, la lettre de mandat du ministre ainsi que le rapport publié par la commissaire à l'environnement et au développement durable au printemps 2018.

Il est important de mentionner que ce document est loin d'être définitif. Par exemple, pour que ce document soit équilibré à l'échelle nationale, nous souhaitons inclure à l'annexe 2 d'autres exemples d'application sur la côte est.

Avant de collaborer avec les provinces, les territoires et les peuples autochtones, nous désirons d'abord obtenir des commentaires à l'interne. Mardi, l'équipe de la Gestion de l'aquaculture a envoyé une version du document à ses directeurs régionaux afin d'obtenir leurs commentaires sur l'applicabilité du cadre à l'aquaculture, ainsi que des suggestions de modifications ou d'améliorations, le cas échéant.

Vous trouverez ci-joint la version la plus récente sur laquelle vous devez vous baser pour effectuer votre examen. Malheureusement, elle n'est disponible qu'en anglais pour le moment; vous recevrez la version traduite dès qu'elle sera prête.

L'équipe de la Gestion de l'aquaculture a demandé que les commentaires soient fournis d'ici le vendredi 12 octobre 2018. Les commentaires des Sciences des écosystèmes et des océans doivent donc aussi être soumis d'ici cette date.

Nous vous demandons de mobiliser, en plus de votre personnel d'aquaculture, la communauté scientifique de Pêches et Océans Canada (MPO) de votre région (le personnel scientifique des pêches et de l'habitat, etc.).

Veuillez envoyer vos commentaires, vos corrections et vos suggestions à Ingrid Burgetz et Jay Parsons, avec copie conforme à Wayne Moore, d'ici le 12 octobre. Ingrid et Ed Porter de l'équipe de la Gestion de l'aquaculture intégreront par la suite tous les commentaires reçus dans la prochaine version. De plus, on nous a demandé de convoquer une réunion d'examen technique du document avec des experts internes (scientifiques et gestionnaires) et externes. Nous vous contacterons bientôt pour des participants régionaux (Science de l'aquaculture des pêches ou de l'habitat). Ce sera également une approche supplémentaire ou alternative pour fournir une contribution régionale au document.

Par la suite, les prochaines étapes seront les suivantes :

- Le MPO finalisera le document aux fins de consultation externe et de présentation au ministre.
- Les équipes des sciences et de la direction du MPO effectueront un examen technique interne et externe du document (les détails seront fournis sous peu).
- Des consultations seront menées auprès des provinces et territoires par l'intermédiaire du Conseil canadien des ministres des pêches et de l'aquaculture.
- L'industrie sera consultée.
- Les peuples autochtones seront consultés.
- Le grand public sera consulté (par l'entremise du site Web du MPO).
- La version définitive du document sera affichée sur le site Web du MPO.

Je vous remercie grandement pour votre collaboration et votre soutien.

Je tiens à m'excuser pour les délais serrés, mais ce dossier est d'un grand intérêt pour le ministre.

Jay

On behalf of SRS and EOSS

Jay Parsons, PhD
Director

Aquaculture, Biotechnology and Aquatic Animal Health Sciences Branch
Fisheries and Oceans Canada / Government of Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tel. 613-990-0278

Directeur

Direction des sciences de l'aquaculture, de la biotechnologie et santé des animaux aquatiques
Pêches et Océans Canada / Gouvernement du Canada
200 Kent Street, Stn 12E239 Ottawa, ON Canada K1A 0E6
Jay.Parsons@dfo-mpo.gc.ca / Tél. 613-990-0278



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Review of Draft Application of the Precautionary Approach within a Risk Management Framework for Aquaculture. September 29, 2018

#1 The document makes no mention of DFO's previous work on risk assessment of aquaculture, other than the Pathways of Effects model reviewed in 2009. Pathways of Effects is not a risk assessment tool, but can be used to scope a risk assessment. There are a number of other risk assessment initiatives within DFO that would be useful to examine, build upon and reference (Mimeault et al 2017; Bastien-Daigle 2007; DFO 2006). See section below for more details.

#2 p. 3 "Therefore, the threshold for unacceptable harm to fish or fish habitat is any activity that has the potential to cause a population-level effect to fish species." This may be the most important statement in the entire document and should be worded very carefully. In particular, it needs to be deconstructed to address the definition of harm and its acceptability (threshold). Both the federal and provincial environmental assessment has definitions and guidance for evaluating projects (which could be used for activities or sectors, such as aquaculture). CEAA focuses on "significant adverse environmental effects" and evaluates three components – whether the environmental effects are adverse, whether the adverse environmental effects are significant, and finally, whether the significant adverse environmental effects are likely. <https://www.canada.ca/en/environmental-assessment-agency/services/policy-guidance/determining-project-cause-significant-environmental-effects-ceaa2012.html>

Thresholds are a value judgement, typically set by regulators, through consideration of evidence and societal acceptance of harm. An adverse effect may be highly unlikely but it may be considered of such significance that the risk is unacceptable. Conversely, there may be significant risk but if the decision-makers feel the benefits of the activity outweigh the possible risks, then it may be an acceptable risk. Suggest you separate harm from its acceptability throughout as these components require different assessment processes and stages of consultation. A number of papers have suggested that the affected communities, First Nations in particular, should be involved both in the definition of threshold significance and the risk assessment (Joseph et al 2017; Murray et al 2018).

#3 The definition of risk and the matrix of evaluating risk is inconsistent with previous work and international standards (why use Risk x Context rather than Exposure x Consequence). The axes of evaluation given (Risk and Context) were not defined anywhere in the document. The colouration of the risk table in the case study is not consistent with the precautionary approach – high risk only comes with High x High interactions on the matrix, while the majority of the possibilities result in a low risk score.

#4 There are numerous unattributed and potentially controversial statements on scientific evidence in the sea lice case study with no references given.

- e.g. p. 18 "Based on the level of scientific certainty that sea lice are not causing harm to wild fish populations the level of concern raised by the public is expected to diminish over time."

- p. 17 “No conclusive evidence has been found to suggest that sea lice originating from farms are causing harm to wild stocks on a wide scale. This has largely been accepted by stakeholders and opponents to the salmon farming industry.” What is a wide scale? Bay, basin, ocean?
- p. 17 “three motile threshold” not defined or referenced
- P. 17 “In the rare instances where farms have not been able to control lice levels during the out-migration period (often as a result of SLICE resistance), lice levels are found to be higher on out-migrating salmon smolts.” How is rare defined?

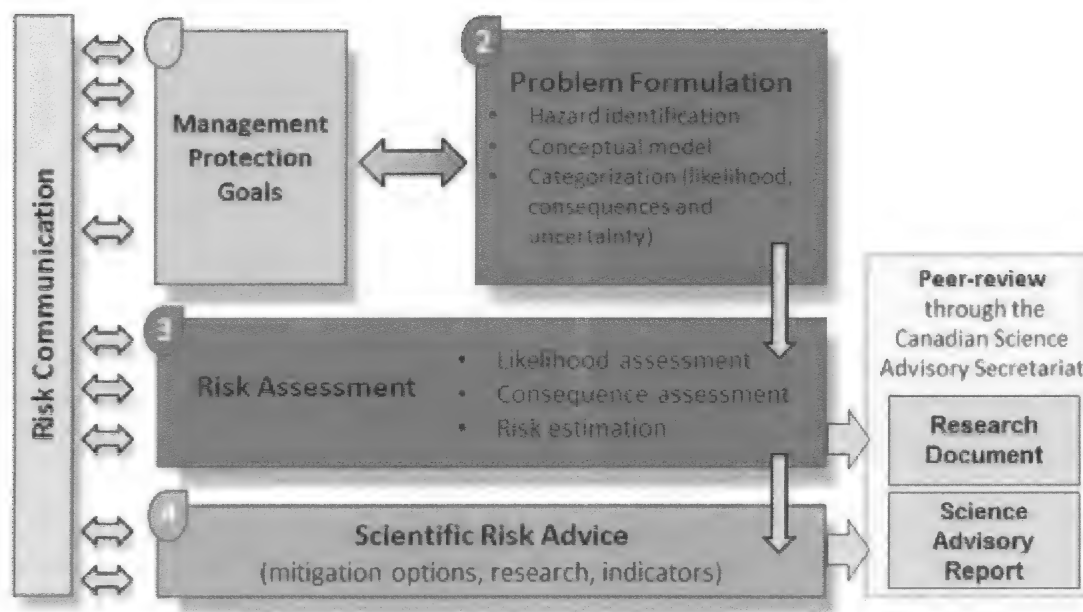
Previous DFO Risk Assessment work

Aquaculture Science Environmental Risk Assessment Initiative <http://www.dfo-mpo.gc.ca/aquaculture/sci-res/asera-eng.htm>. Date modified 2015-06-02. Accessed 2018-09-27

“Fisheries and Oceans Canada (DFO) has launched the Aquaculture Science Environmental Risk Assessment Initiative under the renewed Sustainable Aquaculture Program to support science-based decision-making with regards to aquaculture activities. The Initiative will synthesize data and information, incorporate expert opinion, and provide scientific advice through a series of environmental risk assessments of the potential aquaculture stressors on wild fish and the environment across the country.

The Aquaculture Science Risk Assessment Initiative builds on the 2009 Science Advisory Report Pathways of Effects for Finfish and Shellfish Aquaculture, which describes the potential linkages between aquaculture activities, environmental stressors and effects. Through this process, seven stressor categories were identified: physical alteration of habitat structure; alteration in light; noise; release of chemicals and litter; release or removal of nutrients, non-cultured organisms, and other organic material; release or removal of fish; and release of pathogens.

To ensure consistency throughout the Initiative, the Department has put in place the Aquaculture Science Environmental Risk Assessment Framework outlining the process and components of each assessment. The Framework (Figure 1) is aligned with international and national standards following a four-step process, and is enhanced by external scientific peer-review. This Framework will advance the delivery of systematic, structured, timely, transparent and comprehensive risk assessments.”



The framework was applied and reviewed in a subsequent CSAS process in December 2016: Assessment of the risk to Fraser River sockeye salmon due to Infectious Hematopoietic Necrosis Virus transfer from Atlantic salmon farms located in the Discovery Islands area, British Columbia. National Peer Review - National Capital Region and Pacific Region. December 5-8, 2016, Vancouver, BC.

- Terms of Reference http://www.dfo-mpo.gc.ca/csas-sccs/Schedule-Horraire/2016/12_05-08-eng.html.
- Science Advisory Report http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2017/2017_048-eng.html.
- Research Document (1/5 total) Mimeault, C., Wade, J., Foreman, M.G.G., Chandler, P.C., Aubry, P., Garver, K.A., Grant, S.C.H., Holt, C., Jones, S.R.M., Johnson, S.C., Trudel, M., Burgetz, I.J. and Parsons, G.J. 2017. Assessment of the risks to Fraser River Sockeye Salmon due to Infectious Hematopoietic Necrosis Virus (IHNV) transfer from Atlantic Salmon farms in the Discovery Islands of British Columbia. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/075. vii + 75 p. http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2017/2017_075-eng.html

Other DFO risk assessment work of interest:

DFO. 2006. Assessing habitat risks associated with bivalve aquaculture in the marine environment. National Capital Region. Canadian Science Advisory Secretariat Science Advisory Report 2006/005

Bastien-Daigle, S., Hardy, M., Robichaud, G. 2007. Habitat management qualitative risk assessment: Water column oyster aquaculture in New Brunswick. Canadian Technical Report of Fisheries and Aquatic Sciences 2728.

O, M., Martone, R., Hannah, L., Greig, L., Boutillier, J., and Patton, S. 2014. An Ecological Risk Assessment Framework (ERAF) for Ecosystem-based Oceans Management in the Pacific Region. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/072.vii + 59 p. <http://waves-vagues.dfo-mpo.gc.ca/Library/360156.pdf>

Thornborough, K., Dunham, J., O, M. 2016. Development of risk-based indicators for the SGaan Kinghlas-Bowie Seamount Marine Protected Area. DFO Can. Sci. Advis. Sec. Res. Doc. 2016/027. <http://waves-vagues.dfo-mpo.gc.ca/Library/363985.pdf>

Rubidge, E., Thornborough, K., O, M. 2018. Ecological Risk Assessment for the Effects of Human Activities on the SGaan Kinghlas-Bowie Seamount Marine Protected Area. DFO Can. Sci. Advis. Sec. Res. Doc. 2018/012. viii + 98 p.

Lawson, J. W., Lesage, V. 2012. A draft framework to quantify and cumulate risks of impacts from large development projects for marine mammal populations: A case study using shipping associated with the Mary River Iron mine project. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/154. <http://waves-vagues.dfo-mpo.gc.ca/Library/348009.pdf>

Holt, K.R., Ackerman, B., Flemming, R., Forrest, R., Kronlund, A., Lacko, L., Rutherford, K., Workman, G.D., and Taylor, N. 2012. Ecological Risk Assessment for the Effects of Fishing: A Pilot Study for British Columbia Groundfish Fisheries. Canadian Technical Report of Fisheries and Aquatic Sciences. Vol 2990. <http://waves-vagues.dfo-mpo.gc.ca/Library/347602.pdf>

Minor revisions

p.3 states "In Canada, aquaculture is a relatively new industry..." Finfish aquaculture is relatively new, but shellfish aquaculture goes back more than 100 years on the Pacific coast. Additionally, First Nations have been using shellfish aquaculture for thousands of years.

Higgins, Mark

From: Lowe, Carmel
Sent: September-28-18 9:22 AM
To: Higgins, Mark
Subject: FW: URGENT INFORMAL: Sea Lice

See request below – can you provide a bullet that indicates – there are several species of sea lice ... with x,y,z being the most common...’ or something similar to address the DMO question....?

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca
Telephone | Téléphone 250-756-7177
Facsimile | Télécopieur 250-729-8360
Government of Canada | Gouvernement du Canada

From: Kaba, Kyle
Sent: September 28, 2018 8:50 AM
To: Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>
Subject: RE: URGENT INFORMAL: Sea Lice

Hi Carmel,

Thanks again for the quick response to this. Quick follow up question from DMO. First bullet: What does Leps refer to? I'm assuming it's a certain type of species but can we be more explicit with the first bullet?

I noted Simon is out of office today so I'm reaching out to you. Thanks in advance!

Kyle

From: Lowe, Carmel
Sent: September-26-18 4:43 PM
To: Thomson, Andrew
Cc: Kaba, Kyle
Subject: FW: URGENT INFORMAL: Sea Lice

Info from Simon below..... let me know if we can provide anything additional.

Carmel

Carmel Lowe, Ph.D.
Regional Director Science | Directrice régionale des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada

Pacific Biological Station | Station biologique du Pacifique
3190 Hammond Bay Rd, Nanaimo, BC, Canada V9T 6N7

Carmel.Lowe@dfo-mpo.gc.ca

Telephone | Téléphone 250-756-7177

Facsimile | Télécopieur 250-729-8360

Government of Canada | Gouvernement du Canada

From: Jones, Simon

Sent: September 26, 2018 4:17 PM

To: Lowe, Carmel <Carmel.Lowe@dfo-mpo.gc.ca>

Cc: Higgins, Mark <Mark.Higgins@dfo-mpo.gc.ca>

Subject: RE: URGENT INFORMAL: Sea Lice

Carmel, Mark,

I have reorganized the material to bring the more relevant points to the fore:

Related to the Ha-Shilth-Sa article:

- DFO's sea lice regulations focus only on Leps and include a management threshold of 3 lice per fish.
- Prior to closure of the site there was an infestation with another sea lice species, "Caligus".
- The Caligus infestation was sufficiently severe to cause a fish welfare concern and trigger a SLICE treatment.
- Although the SLICE treatment was successful, the farm was closed [REDACTED]
- Persistent, high levels of Caligus are rare on farmed fish; as are welfare concerns caused by this parasite.
- Caligus is a common parasite of herring and stickleback in coastal BC.

Here are DFO's most recent approved media lines relating to sea lice/salmon farming in Clayoquot.

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutant used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).
- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

Please let me know if these require refinement.

Simon

From: Lowe, Carmel
Sent: September-26-18 2:29 PM
To: Higgins, Mark; Jones, Simon
Subject: Fw: URGENT INFORMAL: Sea Lice

See request below.....

Simon - can you develop some bullets to feed into this?

Carmel

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Kaba, Kyle <Kyle.Kaba@dfo-mpo.gc.ca>
Sent: Wednesday, September 26, 2018 14:17
To: Thomson, Andrew; Lowe, Carmel
Subject: FW: URGENT INFORMAL: Sea Lice

Hi Andy/Carmel – We've received an urgent request from MINO on information (that could be shared with the Province) concerning the article linked below. Article is regarding high sea lice counts leading to Cermaq closing farm sites in Clayoquot Sound.

Can you please have a look and provide a few bullets that can be shared with MINO (for sharing with the Province). MINO has requested info as soon as possible. Would it be possible to have something by tomorrow at noon PST? Please let me know.

Thanks in advance and sorry for the short turn around.

Kyle

From: Butcher, Ashley
Sent: September-26-18 1:42 PM
To: Kaba, Kyle
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie
Subject: Re: URGENT INFORMAL: Sea Lice

Hey Kyle - over to you!

From: Richter, Julie
Sent: Wednesday, September 26, 2018 4:32 PM
To: Butcher, Ashley; White, Andrea
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler; Villeneuve, Anne-Marie
Subject: RE: URGENT INFORMAL: Sea Lice

Hi Ashley – Pacific Region would be best placed to respond.
Julie

From: Butcher, Ashley
Sent: September-26-18 4:22 PM
To: White, Andrea; Richter, Julie; Villeneuve, Anne-Marie
Cc: Jarjour, Jasmine; Hirani, Samia; Khwaja, Saba; Kahn, Zoe; Barker, Tyler
Subject: URGENT INFORMAL: Sea Lice

Hey there - not sure who to direct this to. MINO urgently looking for information that could be shared with the province concerning the attached:

<https://hashilthsa.com/news/2018-09-17/high-sea-lice-counts-leads-cermaq-close-farm-site-clayoquot-sound>

Thanks,

Ashley

Rainer, Michelle

From: Imbeau, Michelle
Sent: October-03-18 6:27 PM
To: Rainer, Michelle
Subject: Fw: URGENT: Media request on sea lice for approval

Approved. For your files.

Michelle Imbeau
Communications Advisor for the Canadian Coast Guard
Fisheries and Oceans Canada / Government of Canada
Office: 604-666-2872 / Cell: [REDACTED]

Conseillère en communications, Garde côtière canadienne
Pêches et Océans Canada / Gouvernement du Canada
Tél : 604-666-2872 / Tél cel : [REDACTED]

From: Reid, Rebecca <Rebecca.Reid@dfo-mpo.gc.ca>
Sent: Wednesday, October 3, 2018 4:32 PM
To: Imbeau, Michelle
Cc: Fogliato, Cara
Subject: RE: URGENT: Media request on sea lice for approval

I approve.

RR

Rebecca Reid
Regional Director General/ Directrice générale régionale
Fisheries and Oceans Canada - Pacific Region/ Pêches et Océans Canada - Région du Pacifique
200-401 Burrard Street / 401, rue Burrard, bureau 200
Vancouver, BC/CB V6C 3S4
Office / Téléphone: 604-666-6098
Cell / Cellulaire: [REDACTED]
E-mail/ Courriel: rebecca.reid@dfo-mpo.gc.ca

From: Imbeau, Michelle
Sent: Wednesday, October 3, 2018 3:44 PM
To: Reid, Rebecca <Rebecca.Reid@dfo-mpo.gc.ca>
Cc: Fogliato, Cara <Cara.Fogliato@dfo-mpo.gc.ca>
Subject: FW: URGENT: Media request on sea lice for approval
Importance: High

Rebecca: The Globe and Mail reporter had one additional follow-up question about aquaculture/sea lice. The yellow highlight is a new message for approval. The intention is to send all three of these messages to her.

Thank you,

s.16(2)(c)

Michelle
A/Team Lead

Follow-up Globe and Mail question: Have there been any B.C. fish farm sites closed as a result of sea lice concerns in 2018 to date?

Approved by: Bernie Taekema, Brenda McCorquodale, Allison Webb, Jennifer Nener

- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- DFO has not closed any aquaculture sites due to sea lice concerns; however, the Department has withheld approval of applications to increase production in cases where sea lice levels were above the regulatory threshold. **new**

Original request:

Issue: [REDACTED] Globe and Mail [REDACTED] She is working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. She has already spoken to Cermaq and has a follow-up question for DFO:

Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

Deadline: Friday, September 21 at 3:00 p.m.

Approved by: Zac Waddington, Adrienne Paylor, Andy Thomson, Bonnie Antcliffe (A/RDG Pacific), shared FYI for awareness with JF LaRue, Philippe Morel, Wayne Moore and Arran McPherson

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutic used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).
- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
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- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm

s.19(1)

- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

No information has been removed or severed from this page